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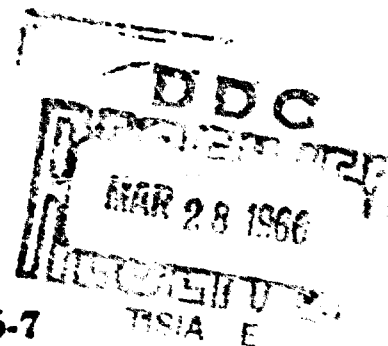
OXIDATION-CORROSION CHARACTERISTICS OF AIRCRAFT TURBINE ENGINE LUBRICANTS

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Southwest Research Institute

TECHNICAL REPORT NO. AFAPL-TR-66-7
February 1966

Air Force Aero Propulsion Laboratory
— Research and Technology Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio



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ERRATA - March 1966

The following corrections are applicable to AFAPL-TR-66-7, Oxidation-Corrosion Characteristics of Aircraft Turbine Engine Lubricants, February 1966:

Page 7

Substitute the entire Table 1 given below for the Table 1 now printed on this page:

TABLE 1. DESCRIPTION OF TEST LUBRICANTS

Oil Code	Viscosity, cs		NN, mg KOH/g	Description
	100°F	210°F		
O-60-8	16.1	4.2	0.18	*MIL-L-7808 E type
O-60-18	12.1	3.2	0.19	MIL-L-7808 E
O-61-11	15.7	4.1	0.39	MIL-L-7808 E
O-62-3	15.5	3.8	0.02	MIL-L-7808 E
O-62-4	15.0	3.9	0.11	*MIL-L-7808 E type
O-62-6	17.8	4.7	0.24	MIL-L-7808 E
O-62-7	17.4	4.2	0.01	*MIL-L-7808 type
O-62-13	16.0	4.2	0.25	MIL-L-7808 E
O-62-16	16.8	4.4	0.22	MIL-L-7808 E
O-63-1	17.5	4.6	0.23	*MIL-L-7808 type
O-63-2	16.3	4.3	0.22	*MIL-L-7808 type
O-63-3	15.2	4.1	0.24	*MIL-L-7808 type
O-63-7	12.8	3.4	0.10	MIL-L-7808 type
O-63-8	13.8	3.5	0.15	*MIL-L-7808 E type
O-63-12	15.5	3.9	0.23	MIL-L-7808 type
O-63-13	16.9	4.4	0.05	MIL-L-7808 type
O-63-16	16.5	4.3	0.29	MIL-L-7808 E
O-64-2	27.5	5.1	0.07	MIL-L-23699
O-64-12	13.8	3.5	0.25	*MIL-L-7808 D
O-64-13	28.4	5.3	0.28	MIL-L-23699 type
O-64-16	13.1	3.3	0.17	MIL-L-7808 D
O-64-18	16.8	4.3	0.11	*MIL-L-7808 E
O-64-21	15.6	3.6	0.07	MIL-L-7808 type
O-64-22	18.3	4.1	0.17	MIL-L-7808 type
O-64-25	28.8	5.4	0.0	*MIL-L-23699
O-64-26	12.8	3.1	0.33	MIL-L-7808 type
O-65-1	14.9	3.8	0.07	MIL-L-7808 type
O-65-2	13.3	3.1	0.64	MIL-L-7808 type
O-65-3	17.0	4.5	0.24	MIL-L-7808 type
O-65-4	27.9	5.3	0.15	MIL-L-23699 type
O-65-5	19.4	4.0	0.15	MIL-L-7808 type
O-65-8	19.1	4.1	0.01	MIL-L-7808 type
O-65-14	17.7	4.7	0.24	MIL-L-7808 type
O-65-15	27.2	5.0	0.02	*MIL-L-23699
O-65-16	28.7	5.1	0.20	*MIL-L-23699
O-65-18	17.6	4.6	0.21	MIL-L-7808 type
O-65-19	17.7	4.7	0.25	MIL-L-7808 type
O-65-21	15.1	3.8	0.07	MIL-L-7808 type
O-65-23	12.6	3.2	0.20	MIL-L-7808 type
O-65-24	15.2	3.7	0.13	MIL-L-7808 type
O-65-27	15.2	4.0	0.26	MIL-L-7808 type
O-65-28	12.9	3.3	0.30	MIL-L-7808 type
O-65-31	13.4	3.2	0.08	MIL-L-7808 type
65-L-114	13.5	3.5	0.10	MIL-L-7808 E
65-L-115	14.3	1.6	0.09	MIL-L-7808 E
65-L-116	16.8	4.3	0.11	MIL-L-7808 E
J-1003(a)	14.8	3.8	0.10	Blend of 65-L-114, -115, and -116
J-1007(a)	16.5	4.2	0.15	Blend of O-62-3 and O-62-6
J-1011(a)	28.4	5.4	0.14	Blend of O-64-13 and O-64-25
J-1020(a)	27.9	5.2	0.17	Blend of O-64-2 and O-64-13
J-1021(a)	28.1	5.2	0.04	Blend of O-64-2 and O-64-25
J-1025(a)	28.2	5.2	0.12	Blend of O-64-2, O-64-13, and O-64-25

(a) Blends consist of equal parts by volume of the indicated constituents.

* Description changed from that shown in original report.

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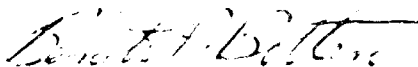
Southwest Research Institute

FOREWORD

This report was prepared at Southwest Research Institute under Contract AF 33(615)-2384. The contract was initiated under Project No. 3044, Task No. 304401. The work was administered by the Fuels, Lubrication, and Hazards Branch, Air Force Aero Propulsion Laboratory, Research and Technology Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. The project engineers were Messrs. G. A. Beane and L. J. DeBrohun and Lt. J. C. Ghiglieri.

This report covers one phase of work performed under the subject contract in the period of February 1, 1965 through September 1, 1965. The manuscript of this report was released by the authors October 1965 for publication as an AFAPL Technical Report.

This technical report has been reviewed and is approved.



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ABSTRACT

Oxidation-corrosion test data are presented for 46 lubricants, 40 MIL-L-7808 type lubricants and six MIL-L-23699 type lubricants, evaluated at one or more temperatures within the range of 350 to 400°F. In addition, the compatibility of selected lubricants when blended with lubricants of the same general class was evaluated. The test conditions which were varied were temperature and the use of reflux and nonreflux glassware configurations. Relatively mild oxidative degradation occurred at 350 and 375°F test conditions. Using an arbitrary rating point of 100 percent viscosity increase (100°F) as the maximum viscosity increase allowable for satisfactory performance, 23 of the 37 lubricants evaluated at 385°F were satisfactory using the nonreflux test procedure. Sixteen of the 29 lubricants evaluated at 390°F were satisfactory and only four of the 16 evaluated at 400°F provided satisfactory performance. The effect of condensate return at 385°F revealed that the majority of lubricants evaluated were unaffected.

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TABLE OF CONTENTS

	<u>Page</u>
I INTRODUCTION	1
II TEST APPARATUS AND PROCEDURES	2
A. Test Glassware	2
B. Heating Bath	2
C. Air Supply System	4
D. Metal Test Specimens	4
E. Test Procedures	4
III TEST LUBRICANTS	6
IV TEST RESULTS AND DISCUSSION	8
A. Effect of Test Temperature	8
B. Effect of Condensate Return	15
C. Results on Lubricant Blends	17
V CONCLUSIONS	22
APPENDIX	23

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Description of Test Lubricants	7
2	Summary of Oxidation-Corrosion Test Viscosity Increase Data	9
3	Summary of Oxidation-Corrosion Test Neutralization Number Data	10
4	Repeatability of Oxidation-Corrosion Test Viscosity Results	13
5	Significant Metal Specimen Corrosion	14
6	Significant Metal Specimen Deposits	16
7	Oxidation-Corrosion Test Results on the Effect of Condensate Return at 385°F	18
8	Viscosity Increase Data on Lubricant Blends and Blend Constituents	19
9	Neutralization Number Data on Lubricant Blends and Blend Constituents	21
10	Results of Nonreflux Oxidation-Corrosion Test on O-60-8 at 350°F	24
11	Results of Nonreflux Oxidation-Corrosion Test on O-60-8 at 375°F	25
12	Results of Nonreflux Oxidation-Corrosion Test on O-60-8 at 385°F	26
13	Results of Nonreflux Oxidation-Corrosion Test on O-60-8 at 390°F	27
14	Results of Nonreflux Oxidation-Corrosion Test on O-60-8 at 400°F	28
15	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 350°F	29
16	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 375°F	30

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
17	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 385°F	31
18	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 390°F	32
19	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 390°F	33
20	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 400°F	34
21	Results of Nonreflux Oxidation-Corrosion Test on O-60-18 at 400°F	35
22	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 350°F	36
23	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 375°F	37
24	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 385°F	38
25	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 385°F	39
26	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 390°F	40
27	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 390°F	41
28	Results of Nonreflux Oxidation-Corrosion Test on O-61-11 at 400°F	42
29	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 350°F	43
30	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 375°F	44
31	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 385°F	45

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
32	Results of Reflux Oxidation-Corrosion Test on O-62-3- at 385°F	46
33	Results of Reflux Oxidation-Corrosion Test on O-62-3 at 385°F	47
34	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 390°F	48
35	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 390°F	49
36	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 400°F	50
37	Results of Nonreflux Oxidation-Corrosion Test on O-62-3 at 400°F	51
38	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 350°F	52
39	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 375°F	53
40	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 385°F	54
41	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 385°F	55
42	Results of Reflux Oxidation-Corrosion Test on O-62-4 at 385°F	56
43	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 390°F	57
44	Results of Nonreflux Oxidation-Corrosion Test on O-62-4 at 400°F	58
45	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 350°F	59
46	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 375°F	60

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
47	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 385°F	61
48	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 385°F	62
49	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 385°F	63
50	Results of Reflux Oxidation-Corrosion Test on O-62-6 at 385°F	64
51	Results of Reflux Oxidation-Corrosion Test on O-62-6 at 385°F	65
52	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 390°F	66
53	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 390°F	67
54	Results of Nonreflux Oxidation-Corrosion Test on O-62-6 at 400°F	68
55	Results of Nonreflux Oxidation-Corrosion Test on O-62-7 at 390°F	69
56	Results of Nonreflux Oxidation-Corrosion Test on O-62-13 at 375°F	70
57	Results of Nonreflux Oxidation-Corrosion Test on O-62-13 at 385°F	71
58	Results of Nonreflux Oxidation-Corrosion Test on O-62-13 at 390°F	72
59	Results of Nonreflux Oxidation-Corrosion Test on O-62-13 at 400°F	73
60	Results of Nonreflux Oxidation-Corrosion Test on O-62-16 at 375°F	74
61	Results of Nonreflux Oxidation-Corrosion Test on O-62-16 at 385°F	75

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
62	Results of Reflux Oxidation-Corrosion Test on O-62-16 at 385°F	76
63	Results of Nonreflux Oxidation-Corrosion Test on O-62-16 at 390°F	77
64	Results of Nonreflux Oxidation-Corrosion Test on O-62-16 at 390°F	78
65	Results of Nonreflux Oxidation-Corrosion Test on O-62-16 at 400°F	79
66	Results of Nonreflux Oxidation-Corrosion Test on O-63-1 at 390°F	80
67	Results of Nonreflux Oxidation-Corrosion Test on O-63-2 at 390°F	81
68	Results of Nonreflux Oxidation-Corrosion Test on O-63-3 at 390°F	82
69	Results of Nonreflux Oxidation-Corrosion Test on O-63-7 at 390°F	83
70	Results of Nonreflux Oxidation-Corrosion Test on O-63-8 at 375°F	84
71	Results of Nonreflux Oxidation-Corrosion Test on O-63-8 at 385°F	85
72	Results of Nonreflux Oxidation-Corrosion Test on O-63-8 at 390°F	86
73	Results of Nonreflux Oxidation-Corrosion Test on O-63-8 at 400°F	87
74	Results of Nonreflux Oxidation-Corrosion Test on O-63-8 at 400°F	88
75	Results of Nonreflux Oxidation-Corrosion Test on O-63-12 at 390°F	89
76	Results of Nonreflux Oxidation-Corrosion Test on O-63-13 at 390°F	90

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
77	Results of Nonreflux Oxidation-Corrosion Test on O-63-16 at 385°F	91
78	Results of Reflux Oxidation-Corrosion Test on O-63-16 at 385°F	92
79	Results of Nonreflux Oxidation-Corrosion Test on O-63-16 at 390°F	93
80	Results of Nonreflux Oxidation-Corrosion Test on O-63-16 at 400°F	94
81	Results of Nonreflux Oxidation-Corrosion Test on O-64-2 at 375°F	95
82	Results of Nonreflux Oxidation-Corrosion Test on O-64-2 at 385°F	96
83	Results of Reflux Oxidation-Corrosion Test on O-64-2 at 385°F	97
84	Results of Nonreflux Oxidation-Corrosion Test on O-64-2 at 390°F	98
85	Results of Nonreflux Oxidation-Corrosion Test on O-64-2 at 400°F	99
86	Results of Nonreflux Oxidation-Corrosion Test on O-64-12 at 375°F	100
87	Results of Nonreflux Oxidation-Corrosion Test on O-64-12 at 385°F	101
88	Results of Nonreflux Oxidation-Corrosion Test on O-64-12 at 390°F	102
89	Results of Nonreflux Oxidation-Corrosion Test on O-64-12 at 400°F	103
90	Results of Nonreflux Oxidation-Corrosion Test on O-64-13 at 375°F	104
91	Results of Nonreflux Oxidation-Corrosion Test on O-64013 at 385°F	105

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
92	Results of Reflux Oxidation-Corrosion Test on O-64-13 at 385°F	106
93	Results of Nonreflux Oxidation-Corrosion Test on O-64-13 at 390°F	107
94	Results of Nonreflux Oxidation-Corrosion Test on O-64-13 at 400°F	108
95	Results of Nonreflux Oxidation-Corrosion Test on O-64-16 at 385°F	109
96	Results of Nonreflux Oxidation-Corrosion Test on O-64-16 at 390°F	110
97	Results of Nonreflux Oxidation-Corrosion Test on O-64-16 at 390°F	111
98	Results of Nonreflux Oxidation-Corrosion Test on O-64-16 at 400°F	112
99	Results of Nonreflux Oxidation-Corrosion Test on O-64-18 at 375°F	113
100	Results of Nonreflux Oxidation-Corrosion Test on O-64-18 at 385°F	114
101	Results of Nonreflux Oxidation-Corrosion Test on O-64-18 at 390°F	115
102	Results of Nonreflux Oxidation-Corrosion Test on O-64-18 at 400°F	116
103	Results of Nonreflux Oxidation-Corrosion Test on O-64-21 at 390°F	117
104	Results of Nonreflux Oxidation-Corrosion Test on O-64-22 at 385°F	118
105	Results of Reflux Oxidation-Corrosion Test on O-64-22 at 385°F	119
106	Results of Nonreflux Oxidation-Corrosion Test on O-64-22 at 390°F	120

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
107	Results of Nonreflux Oxidation-Corrosion Test on O-64-22 at 390°F	121
108	Results of Nonreflux Oxidation-Corrosion Test on O-64-22 at 400°F	122
109	Results of Nonreflux Oxidation-Corrosion Test on O-64-25 at 385°F	123
110	Results of Reflux Oxidation-Corrosion Test on O-64-25 at 385°F	124
111	Results of Reflux Oxidation-Corrosion Test on O-64-25 at 385°F	125
112	Results of Nonreflux Oxidation-Corrosion Test on O-64-26 at 385°F	126
113	Results of Reflux Oxidation-Corrosion Test on O-64-26 at 385°F	127
114	Results of Nonreflux Oxidation-Corrosion Test on O-64-26 at 390°F	128
115	Results of Nonreflux Oxidation-Corrosion Test on O-65-1 at 385°F	129
116	Results of Reflux Oxidation-Corrosion Test on O-65-1 at 385°F	130
117	Results of Nonreflux Oxidation-Corrosion Test on O-65-1 at 390°F	131
118	Results of Nonreflux Oxidation-Corrosion Test on O-65-2 at 385°F	132
119	Results of Reflux Oxidation-Corrosion Test on O-65-2 at 385°F	133
120	Results of Nonreflux Oxidation-Corrosion Test on O-65-2 at 390°F	134
121	Results of Nonreflux Oxidation-Corrosion Test on O-65-3 at 385°F	135

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
122	Results of Reflux Oxidation-Corrosion Test on O-65-3 at 385°F.	136
123	Results of Nonreflux Oxidation-Corrosion Test on O-65-4 at 385°F.	137
124	Results of Reflux Oxidation-Corrosion Test on O-65-4 at 385°F.	138
125	Results of Nonreflux Oxidation-Corrosion Test on O-65-4 at 390°F.	139
126	Results of Nonreflux Oxidation-Corrosion Test on O-65-5 at 385°F.	140
127	Results of Reflux Oxidation-Corrosion Test on O-65-5 at 385°F.	141
128	Results of Nonreflux Oxidation-Corrosion Test on O-65-5 at 390°F.	142
129	Results of Nonreflux Oxidation-Corrosion Test on O-65-8 at 385°F.	143
130	Results of Nonreflux Oxidation-Corrosion Test on O-65-8 at 385°F.	144
131	Results of Reflux Oxidation-Corrosion Test on O-65-8 at 385°F.	145
132	Results of Nonreflux Oxidation-Corrosion Test on O-65-14 at 385°F.	146
133	Results of Reflux Oxidation-Corrosion Test on O-65-14 at 385°F.	147
134	Results of Nonreflux Oxidation-Corrosion Test on O-65-15 at 385°F.	148
135	Results of Reflux Oxidation-Corrosion Test on O-65-15 at 385°F.	149
136	Results of Nonreflux Oxidation-Corrosion Test on O-65-16 at 385°F.	150

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
137	Results of Reflux Oxidation-Corrosion Test on O-65-16 at 385°F	151
138	Results of Nonreflux Oxidation-Corrosion Test on O-65-18 at 385°F	152
139	Results of Reflux Oxidation-Corrosion Test on O-65-18 at 385°F	153
140	Results of Nonreflux Oxidation-Corrosion Test on O-65-19 at 385°F	154
141	Results of Reflux Oxidation-Corrosion Test on O-65-19 at 385°F	155
142	Results of Nonreflux Oxidation-Corrosion Test on O-65-21 at 385°F	156
143	Results of Reflux Oxidation-Corrosion Test on O-65-21 at 385°F	157
144	Results of Nonreflux Oxidation-Corrosion Test on O-65-23 at 385°F	158
145	Results of Reflux Oxidation-Corrosion Test on O-65-23 at 385°F	159
146	Results of Nonreflux Oxidation-Corrosion Test on O-65-24 at 385°F	160
147	Results of Reflux Oxidation-Corrosion Test on O-65-24 at 385°F	161
148	Results of Nonreflux Oxidation-Corrosion Test on O-65-27 at 385°F	162
149	Results of Reflux Oxidation-Corrosion Test on O-65-27 at 385°F	163
150	Results of Nonreflux Oxidation-Corrosion Test on O-65-28 at 385°F	164
151	Results of Reflux Oxidation-Corrosion Test on O-65-28 at 385°F	165

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
152	Results of Nonreflux Oxidation-Corrosion Test on O-65-31 at 385°F	166
153	Results of Reflux Oxidation-Corrosion Test on O-65-31 at 385°F	167
154	Results of Nonreflux Oxidation-Corrosion Test on 65-L-114 at 375°F	168
155	Results of Nonreflux Oxidation-Corrosion Test on 65-L-114 at 385°F	169
156	Results of Nonreflux Oxidation-Corrosion Test on 65-L-115 at 375°F	170
157	Results of Nonreflux Oxidation-Corrosion Test on 65-L-115 at 385°F	171
158	Results of Nonreflux Oxidation-Corrosion Test on 65-L-116 at 375°F	172
159	Results of Nonreflux Oxidation-Corrosion Test on J-1003(a) at 375°F	173
160	Results of Nonreflux Oxidation-Corrosion Test on J-1003(a) Using Water-Saturated Air at 375°F	174
161	Results of Nonreflux Oxidation-Corrosion Test on J-1007(a) at 385°F	175
162	Results of Reflux Oxidation-Corrosion Test on J-1007(a) at 385°F	176
163	Results of Reflux Oxidation-Corrosion Test on J-1007(a) at 385°F	177
164	Results of Nonreflux Oxidation-Corrosion Test on J-101(a) at 385°F	178
165	Results of Reflux Oxidation-Corrosion Test on J-1011(a) at 385°F	179
166	Results of Reflux Oxidation-Corrosion Test on J-1020(a) at 385°F	180

LIST OF TABLES (Cont'd)

<u>Table</u>		<u>Page</u>
167	Results of Reflux Oxidation-Corrosion Test on J-1021(a) at 385°F	181
168	Results of Reflux Oxidation-Corrosion Test on J-1025(a) at 385°F	182

SECTION I

INTRODUCTION

This report summarizes a selected portion of the work performed at Southwest Research Institute in the period of February 1, 1965, through September 1, 1965, under Contract AF 33(615)-2384, entitled "Lubrication Research for Aero Propulsion Systems." The objectives of this broad program are the development or refinement of lubricant evaluation techniques for aero propulsion systems, and the evaluation of candidate lubricants and lubrication techniques. This report is concerned with only one phase of the overall effort: the oxidation-corrosion characteristics of selected lubricants and lubricant blends in the temperature regime of 350 to 400°F. Work performed under other phases has been dealt with in one previous report* and will be presented in other future reports.

The oxidation-corrosion characteristics of 46 lubricants and six lubricant blends were determined by means of a 48-hour glassware-type test, using a thermostated oil bath. These lubricants, all of MIL-L-7808 and MIL-L-23699 types, were selected and provided by the Air Force Aero Propulsion Laboratory.

*Lubrication Research for Aero Propulsion Systems, Phase Report No. 1, Bearing Support Deposits Program, AFAPL Technical Report 65-118, October 1965.

SECTION II

TEST APPARATUS AND PROCEDURES

A. Test Glassware

The test sample tubes are constructed of standard wall 51-mm Pyrex tubing with a round bottom. A standard taper 71/60 outer joint is provided at the tube top. Overall tube length is 450 ± 10 mm, and the tube immersion depth within the oil-bath is 225 ± 10 mm.

The test tube head is constructed with a standard taper 71/60 ground-glass joint on the lower end which mates with the test cell joint. The upper surface of the head is formed in a dome-shaped contour. Attached to this surface are three female, ground-glass joints. A 10/30 joint is centrally located to accommodate the air tube. A second 10/30 joint, slightly offset from center, provides for temperature measurements and intermediate sampling. Offset and at a 90° position from the sampling port, a 24/40 joint is attached to relieve effluent vapors. Using the condensate return procedure, a 300-mm water-cooled Allihn condenser is directly attached to the latter joint. The nonreflux test procedure employs a connecting arm, with a 15° downward slant, between the 24/40 joint and an overboard condenser. For this work, a 200-mm water-cooled Graham condenser was used.

An air delivery tube of standard 6-mm Pyrex tubing, approximately 600 mm in length, is fixed in the upper end of the head by means of a one-hole cork. The tip of the air tube is cut at a 45° angle and rests directly on the bottom of the sample tube. A small glass collar of sufficient size to hold the metal specimens is located 15 mm from the tip of the air tube. The bottom metal specimen rests directly on this collar, and succeeding specimens are separated by glass spacers 6-mm wide, cut from standard 9-mm Pyrex tubing.

B. Heating Bath

A stirred, thermostated oil bath was employed as the test glassware heat medium. The unit is operated within a fume hood to avoid toxic vapors. As illustrated in Figure 1, the enclosed bath is raised above bench level to allow for operation using overboard condensers for the collection of condensable vapors. The bath will accommodate a maximum of six sample tubes using either a nonreflux glassware configuration (Fig. 1) or a reflux configuration in which the vapor condensers are attached directly above the sample tubes. Tube immersion depth is such that the sample level is approximately 125 mm below the bath level at test temperature.

Temperature control of the oil bath is provided by four 600-watt immersion heaters, one of which is controlled by an adjustable thermost switch.

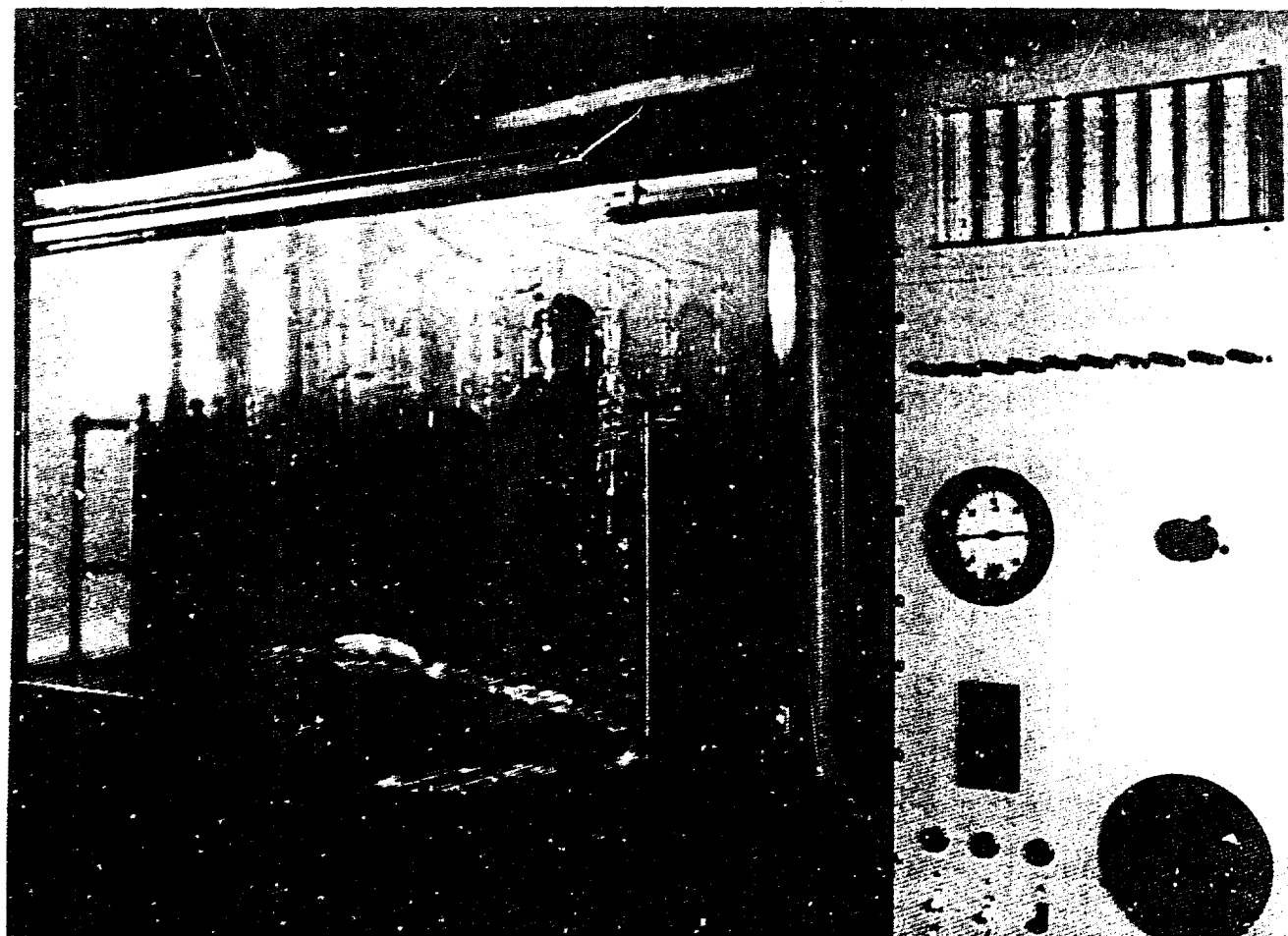


FIGURE 1. OXIDATION-CORROSION TEST APPARATUS

In operation, the continuously-on heater elements are adjusted for optimum control by means of a variable transformer.

C. Air Supply System

A precision air regulator is used to provide a constant air pressure to individual fine-thread needle valves from the laboratory air line. The air is passed through a 4-in. glass-pipe drying column, containing a calcium sulfate drier, thence to a manifold before reaching the individual test tube control valves and flowmeters. Each of the six air flowmeters was calibrated by means of a wet test meter in order to provide accurate measurement of the air flow rate.

D. Metal Test Specimens

The metal corrosion specimens are of the round washer type with dimensions 3/4-in. OD and 1/4-in. ID by 0.032-in. thickness. The following material designations apply to the metals which were used:

Aluminum	QQ-A-250/4b, temper T-3 or T-4
Silver	Electrolytic grade, 99.9%
Copper	QQ-C-576b
Mild steel	QQ-S-698, grade 1009, cold rolled, temper No. 4 or 5
Magnesium	QQ-M-44a (AZ31B)
Titanium	MIL-T-009046 B (ASG), Class 1

As previously noted, the specimens are stacked directly on the air tube, separated by 1/4-in. glass spacers. The metals are arranged in the order given above with aluminum in the lowest position.

E. Test Procedures

In evaluating the oxidation-corrosion properties of the submitted lubricants, only two test conditions were varied: sample temperature and the use of condensate return. In the initial stages of work, lubricant performance was determined at several temperatures (350, 375, 385, 390, and 400°F) in order to select that temperature which would result in a reasonable degradation level. Subsequent tests were generally limited to evaluation at 385 and/or 390°F. All temperatures cited herein refer to sample operating temperature, not bath temperature which is normally 2 to 3°F higher than the sample temperature.

The normal test duration was 48 hours with intermediate sampling (20 ml) at 16, 24, and 40 hours. In some instances, due to severe oil loss or deterioration, the run was terminated at an intermediate sample time. No makeup oil was added for the samples drawn or the oil losses.

The initial sample charge was 200 ml. Test air flow rate was 130 liters/hour dry air. A six-metal corrosion specimen group was used consisting of aluminum, silver, copper, mild steel, magnesium, and titanium.

All lubricant samples were analyzed to determine kinematic viscosity at 100 and 210°F, and neutralization number. In evaluations using the non-reflux apparatus, the overhead fluid was analyzed for 100°F viscosity and neutralization number. Metal specimen attack was determined by weight difference. In addition, the coupons were examined at a 20X microscope magnification to observe the type of metal corrosion, e. g., pitting or etching. Post-test preparation of the metal specimens included a successive rinse in benzene and acetone to remove oil. The individual specimens were benzene swabbed using a series of cotton swabs until clean swabs were noted. The coupons were finally rinsed in benzene and acetone, air dried, and weighed.

For one test series, an electrocleaning procedure was employed following the normal specimen cleanup. The individual metals, except aluminum, were cathodically cleaned in a hot (170 to 190°F) caustic bath. The bath contained an aqueous solution of 15 g/liter sodium hydroxide and 15 g/liter trisodium phosphate. The coupons were cleaned as the cathode for a period of 15 to 30 seconds using a current density of 0.5 amp/inch². After removal from the bath, the specimens were rinsed in cold water and cotton swabbed to remove loose deposits. The metals were weighed after a final rinse in acetone. The aluminum specimens were soaked in concentrated nitric acid for a period of 15 minutes, then rinsed and processed as described above.

Test glassware deposits and sludge were likewise recorded. After test, the entire sample was filtered through a 200-mesh screen to observe bulk sludge deposits. A 25-ml portion of the lubricant sample was then subjected to a 1-hour centrifuging at a relative force of 840 g's in order to measure suspended sludge.

In general, all candidate lubricants were initially evaluated using non-reflux of effluent vapors. Many of the oils were then run to determine the effect of refluxing. All other test conditions, including air flow rate, were the same for both cases. All determinations using condensate return were conducted at 385°F.

SECTION III

TEST LUBRICANTS

A total of 46 lubricants and six lubricant mixtures were evaluated at one or more of five sample temperatures used in the test series. Table 1 presents a listing of the lubricants employed in this program, along with initial viscosity and neutralization number data and available information on lubricant type. Six of the test fluids are typical of the class defined by specification MIL-L-23699. The remaining oils are related to the lubricant type described by MIL-L-7808.

TABLE 1. DESCRIPTION OF TEST LUBRICANTS

Oil Code	Viscosity, cs		NN, mg KOH/g	Description
	100°F	210°F		
O-60-8	16.1	4.2	0.18	MIL-L-7808 E
O-60-18	12.1	3.2	0.19	MIL-L-7808 E
O-61-11	15.7	4.1	0.39	MIL-L-7808 E
O-62-3	15.5	3.8	0.02	MIL-L-7808 E
O-62-4	15.0	3.9	0.11	MIL-L-7808 E
O-62-6	17.6	4.7	0.24	MIL-L-7808 E
O-62-7	17.4	4.2	0.01	MIL-L-7808 D
O-62-13	16.0	4.2	0.25	MIL-L-7808 E
O-62-16	16.8	4.4	0.22	MIL-L-7808 E
O-63-1	17.5	4.6	0.23	MIL-L-7808 D
O-63-2	16.3	4.3	0.22	MIL-L-7808 D
O-63-3	15.2	4.1	0.24	MIL-L-7808 D
O-63-7	12.8	3.4	0.10	MIL-L-7808 type
O-63-8	13.8	3.5	0.15	MIL-L-7808 E
O-63-12	15.5	3.9	0.23	MIL-L-7808 type
O-63-13	16.9	4.4	0.05	MIL-L-7808 type
O-63-16	16.5	4.3	0.29	MIL-L-7808 E
O-64-2	27.5	5.1	0.07	MIL-L-23699
O-64-12	13.8	3.5	0.25	MIL-L-7808 E
O-64-13	28.4	5.3	0.28	MIL-L-23699 type
O-64-16	13.1	3.3	0.17	MIL-L-7808 D
O-64-18	16.8	4.3	0.11	MIL-L-7808 type
O-64-21	15.6	3.6	0.07	MIL-L-7808 type
O-64-22	18.3	4.1	0.17	MIL-L-7808 type
O-64-25	28.8	5.4	0.0	MIL-L-23699 type
O-64-26	12.8	3.1	0.33	MIL-L-7808 type
O-65-1	14.9	3.8	0.07	MIL-L-7808 type
O-65-2	13.3	3.1	0.64	MIL-L-7808 type
O-65-3	17.0	4.5	0.24	MIL-L-7808 type
O-65-4	27.9	5.3	0.15	MIL-L-23699 type
O-65-5	19.4	4.0	0.15	MIL-L-7808 type
O-65-8	19.1	4.1	0.01	MIL-L-7808 type
O-65-14	17.7	4.7	0.24	MIL-L-7808 type
O-65-15	27.2	5.0	0.02	MIL-L-23699 type
O-65-16	26.7	5.1	0.20	MIL-L-23699 type
O-65-18	17.6	4.6	0.21	MIL-L-7808 type
O-65-19	17.7	4.7	0.25	MIL-L-7808 type
O-65-21	15.1	3.8	0.07	MIL-L-7808 type
O-65-23	12.6	3.2	0.20	MIL-L-7808 type
O-65-24	15.2	3.7	0.13	MIL-L-7808 type
O-65-27	15.2	4.0	0.26	MIL-L-7808 type
O-65-28	12.9	3.3	0.30	MIL-L-7808 type
O-65-31	13.4	3.2	0.08	MIL-L-7808 type
65-L-114	13.5	3.5	0.10	MIL-L-7808 E
65-L-115	14.3	3.6	0.09	MIL-L-7808 E
65-L-116	16.8	4.3	0.11	MIL-L-7808 E
J-1003(a)	14.8	3.8	0.10	Blend of 65-L-114, -115, and -116
J-1007(a)	16.5	4.2	0.15	Blend of O-62-3 and O-62-6
J-1011(a)	28.4	5.4	0.14	Blend of O-64-13 and O-64-25
J-1020(a)	27.9	5.2	0.17	Blend of O-64-2 and O-64-13
J-1021(a)	28.1	5.2	0.04	Blend of O-64-2 and O-64-25
J-1025(a)	28.2	5.2	0.12	Blend of O-64-2, O-64-13, and O-64-25

(a) Blends consist of equal parts by volume of the indicated constituents.

SECTION IV

TEST RESULTS AND DISCUSSION

A. Effect of Test Temperature

As a consequence of the large volume of data generated by this work, the following discussions are generally confined to the use of data summaries. Tables 10 to 168 in the Appendix present the detailed results of all determinations. These tables are listed in numerical order by oil code and not necessarily by the testing sequence.

Lubricant viscosity increase was used in this program as the primary criterion in determining lubricant performance. As a general rule, a 100°F viscosity increase in excess of 100 percent was arbitrarily considered the failing point. This rule was not strictly applied, however, and was not intended by any means to indicate official Air Force approval or disapproval. One hundred percent lubricant viscosity increase was used herein chiefly as a dividing line in categorizing fluid capability.

Table 2 summarizes viscosity increase data as affected by increasing test temperature. Lubricant degradation generally followed the normal trend with respect to increasing sample temperature. Viscosity indicated a gradual rise with temperature up to the level of about 100 percent increase. At temperatures beyond that for which a 100 percent viscosity increase was obtained, sample deterioration abruptly accelerated. This observation normally held true with respect to sample neutralization number as shown in Table 3. A typical example of this trend is illustrated for lubricant O-62-3 in Figure 2.

Using 100 percent viscosity increase as the measure of lubricant performance, Table 2 shows that all lubricants evaluated at 350°F underwent relatively mild degradation. Similarly, of the 16 lubricants tested at 375°F, only O-60-8 was unsatisfactory. At the maximum temperature investigated, 400°F, severe deterioration, and in most cases gelation, of the lubricant occurred at 48 hours. Sixteen lubricants were run at 400°F and four showed a passing performance. Of these four, O-63-8, O-64-12, and O-64-22 were MIL-L-7808 type and O-64-2 was MIL-L-23699 type. The remaining five MIL-L-23699 lubricants were not examined at 400°F.

In view of the foregoing observations, it is apparent that the test temperature of most interest, i. e., which gives a reasonable separation among the lubricants, lies within a rather narrow range between 375 and 400°F. Thus, as shown by Table 2, the bulk of the program was conducted at 385 and 390°F. On the basis of sample viscosity, the following data classify the lubricant group with regard to temperature capability:

TABLE 2. SUMMARY OF OXIDATION-CORROSION TEST
VISCOSITY INCREASE DATA

Oil Code	100°F Viscosity Increase, % at 48 hr, for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	40	145	390	482	Gelled(c)
O-60-18	10	15	25	32(a)	38 (a, c)
O-61-11	19	44	103(a)	153(a)	82 (c)
O-62-3	26	48	72	86(a)	387 (a)
O-62-4	17	43	107(a)	241	128 (c)
O-62-6	23	67	122(b)	176(a, c)	Gelled(c)
O-62-7				144	
O-62-13		66	144	327	Gelled(c)
O-62-16		57	70	155(a, c)	Gelled(c)
O-63-1				428	
O-63-2				94	
O-63-3				871(c)	
O-63-7				67(c)	
O-63-8		29	20	24	38
O-63-12				62	
O-63-13				26	
O-63-16			170	320	Gelled(c)
O-64-2		15	19	22	28
O-64-12		13	14	16	23
O-64-13		17	24	26	183
O-64-16			5	28(a)	1365(c)
O-64-18		20	27	31	1140(c)
O-64-21				8	
O-64-22			10	12	16
O-64-25			11		
O-64-26			109	127	
O-65-1			532	2402	
O-65-2			50	60	
O-65-3			319		
O-65-4			16	18	
O-65-5			31	38	
O-65-8			8(a)		
O-65-14			577		
O-65-15			16		
O-65-16			16		
O-65-18			148		
O-65-19			59		
O-65-21			76		
O-65-23			141		
O-65-24			34		
O-65-27			1768		
O-65-28			12,650		
O-65-31			59		
65-L-114		27	52		
65-L-115		16	22		
65-L-116		17			

Without condensate return

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

(c) Values are 40-hr results. In all cases where data are shown for 40 hr, the sample indicated gelation at 48 hr.

TABLE 3. SUMMARY OF OXIDATION-CORROSION TEST
NEUTRALIZATION NUMBER DATA

Oil Code	48-hr Neutralization Number, mg KOH/g. for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	0.49	1.08	1.67	1.68	25.4 (c)
O-60-18	0.42	0.73	1.10	1.64(a)	1.98(a, c)
O-61-11	0.33	0.85	1.28(a)	1.69(a)	1.71(c)
O-62-3	0.52	0.86	1.21	1.41(a)	10.05(a)
O-62-4	0.62	1.23	1.70(a)	2.22	2.49(c)
O-62-6	0.58	0.90	8.75(b)	33.6 (a)	37.9 (c)
O-62-7				9.01	
O-62-13		1.03	1.54	3.17	25.2 (c)
O-62-16		0.99	13.96	31.3 (a)	40.1 (c)
O-63-1				18.93	
O-63-2				11.58	
O-63-3				23.7	
O-63-7				1.39(c)	
O-63-8		0.55	0.50	0.63	0.91(a)
O-63-12				0.91	
O-63-13				1.65	
O-63-16			1.14	6.73	30.3 (c)
O-64-2		0.31	0.38	0.36	0.47
O-64-12		0.96	1.27	1.36	2.24
O-64-13		0.07	0.10	0.09	5.73
O-64-16			1.57	12.68(a)	49.6
O-64-18		1.10	1.69	3.19	34.8 (c)
O-64-21				0.26	
O-64-22			0.41	0.48	0.54
O-64-25			0.15		
O-64-26			0.41	0.46	
O-65-1			26.2	21.5	
O-65-2			0.09	0.07	
O-65-3			2.01		
O-65-4			0.50	0.48	
O-65-5			0.30	0.31	
O-65-8			0.21(a)		
O-65-14			28.9		
O-65-15			0.45		
O-65-16			0.54		
O-65-18			1.85		
O-65-19			1.29		
O-65-21			1.25		
O-65-23			0.84		
O-65-24			0.64		
O-65-27			3.48		
O-65-28			21.80		
O-65-31			0.65		
65-L-114		0.83	1.19		
65-L-115		0.43	0.49		
65-L-116		0.98			

Without condensate return.

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

(c) Values are 40-hr results.

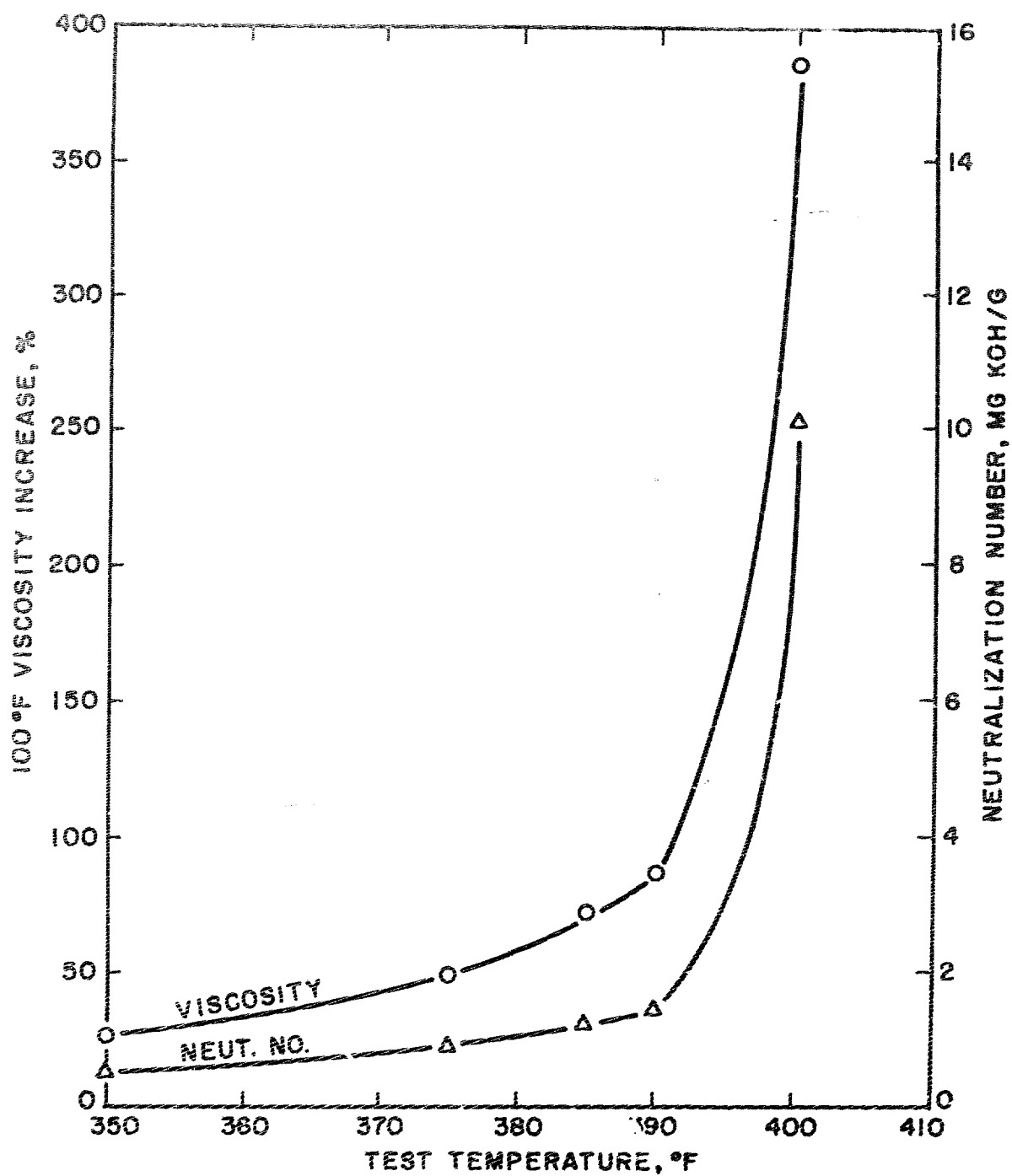


FIGURE 2. EFFECT OF TEMPERATURE ON THE
OXIDATIVE DETERIORATION OF O-62-3

	Test Temperature, °F				
	<u>350</u>	<u>375</u>	<u>385</u>	<u>390</u>	<u>400</u>
Number of lubricants tested	6	16	37	29	16
Number of lubricants passed	6	15	23	16	4

Several duplicate determinations were conducted using the nonreflux test configuration in order to verify the repeatability of the procedure. These results showed very good correspondence of all measured data. The repeatability of viscosity data was the primary concern in this study and, as illustrated by the analysis given in Table 4, the results showed rather good agreement. Only one instance of poor repeatability of duplicate tests was observed. Lubricant O-62-3 when tested at 400°F gave a difference from the mean of 52 percent. This variation, however, is not considered significant in view of the very high level of fluid degradation. The individual determinations in this case were 590 and 184 percent viscosity increase at 100°F.

Metal specimen corrosion for this test series was observed in several cases but was generally confined to the copper and magnesium metals. Significant metal corrosion as described here is defined as a specimen weight loss of 0.20 mg/cm², or more. Some lubricants, which will be identified later, caused significant specimen weight gains, i. e., an increase of 0.20 mg/cm², or more. The latter phenomenon was not restricted to a particular metal type but affected all specimens of the group at random.

Table 5 lists the lubricants and metals for which significant corrosion was obtained in the nonreflux test series. Where no comment is noted for a particular temperature in the table, no test was conducted for that lubricant-temperature combination. As mentioned earlier, corrosion was generally limited to the copper and magnesium metals. The sole exception was a measurable weight loss for silver in the O-61-11 test conducted at 390°F. None of the lubricants evaluated at 350°F showed corrosion of any type. As illustrated in Table 5, metal attack in the 375°F determinations was relatively rare and was confined to copper only. It will be noted that, up to and including the 385°F runs, copper was the only metal indicating attack. At 390 and 400°F, corrosion was more frequently noted for copper, along with two cases of magnesium attack at 390°F and six cases at 400°F.

As discussed herein, metal specimen condition is separated according to those instances of corrosion (weight loss) and those of deposition (weight gain). In the latter case, it should be noted that a combination of corrosion and deposition may prevail, i. e., metal weight loss might be obscured by the presence of significant deposits which cause an overall weight gain.

TABLE 4. REPEATABILITY OF OXIDATION-CORROSION
TEST VISCOSITY RESULTS

<u>Oil Code</u>	<u>No. of Det's</u>	<u>Test Temp, °F</u>	<u>Mean 100°F Vis Increase, %</u>	<u>Max Difference from Mean^(a), %</u>
O-60-18	2	390	32	1
	2	400	38(b)	3
O-61-11	2	385	103	15
	2	390	153	12
O-62-3	2	390	86	1
	2	400	387	52
O-62-4	2	385	107	6
O-62-6	3	385	122	6
	2	390	176(b)	18
O-62-16	2	390	155(b)	12
O-64-16	2	390	28	11
O-65-8	2	385	8	0

Without condensate return.

(a) Max difference from mean $\times 100/\text{mean}$

(b) Values are 40-hr results.

TABLE 5. SIGNIFICANT METAL SPECIMEN CORROSION

Oil Code	Significant Metal Corrosion for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	None	None	None	Cu	Cu, Mg
O-61-11	None	None	None	Ag	None
O-62-3	None	None	None	Cu	Cu, Mg
O-62-6	None	None	Cu	Cu	Cu, Mg
O-62-7				Cu	
O-62-13		None	None	None	Cu
O-62-16		None	None	Cu	Cu, Mg
O-63-7				Cu, Mg	
O-63-8		Cu	Cu	Cu, Mg	Cu
O-63-12				Cu	
O-63-16			None	None	Mg
O-64-2		None	None	None	Cu
O-64-13		Cu	Cu	Cu	Cu
O-64-18		None	None	Cu	Cu
O-64-21				Cu	
O-64-22			None	None	Mg
O-64-26			Cu	Cu	
O-65-1			Cu	Cu	
O-65-2			Cu	Cu	
O-65-4			Cu	Cu	
O-65-5			Cu	Cu	
65-L-115		Cu	None		

Significant metal corrosion, as used here, is defined as a specimen weight loss of 0.20 mg/cm² or more.

The occurrence of significant metal specimen weight gain is described in Table 6. Again, the phenomenon is seen to occur more frequently at the higher test temperatures. In addition, it is apparent that no one metal type was predominantly affected. All metals were susceptible to the deposition effect. Those instances in which all specimens except copper showed significant weight gains are probable illustrations of the effect mentioned previously whereby metal corrosion (weight loss) was offset by the added deposit weight.

The use of an electrocleaning procedure was briefly investigated in the assessment of metal specimen corrosion. The technique was employed on one set of six lubricants evaluated at 385°F using nonreflux. After the normal post-test cleanup, all specimens were processed with the electrocleaning method. The results indicated that specimen weight change was essentially unaffected except for one instance using lubricant O-64-26. These data are listed here:

	Weight Change, mg/cm ²	
	<u>Normal</u>	<u>Electrocleaned</u>
Al	0.0	-0.06
Ti	0.0	-0.02
Ag	-0.06	-0.06
Steel	0.0	-0.02
Cu	-0.28	-0.36
Mg	+0.20	+0.06

Although electrocleaning resulted in a slight weight loss for most metals, the major change occurred with the magnesium specimen which underwent a net weight loss of 0.14 mg/cm². Out of a total of 36 specimens processed, this was the only effect of significance. It should be stated, however, that none of the metals used in this study showed visible evidence of carbonaceous deposits. Had such deposits been present, it is expected that the effect of electrocleaning would have been more pronounced.

B. Effect of Condensate Return

Several of the submitted lubricants were investigated using a condensate return glassware apparatus in order to determine the effect of refluxing of condensable effluent vapors. All runs with this procedure were conducted at 385°F with all other conditions unchanged from those tests performed with nonreflux. Attention is particularly called to the test air flow rate of 130 liters/hour which was used in both reflux and nonreflux tests. As a consequence of the relatively high air flow used, condensation efficiency is very low. Thus, only slight refluxing was actually obtained when using the condensate return configuration. This fact is substantiated by oil loss data which indicate little or no difference in sample weight loss between reflux and nonreflux tests on the test fluids at 385°F.

TABLE 6. SIGNIFICANT METAL SPECIMEN DEPOSITS

Oil Code	Significant Weight Gain for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	None	Steel	None	None	None
O-60-18	Steel	All	All	All less Cu	All less Cu
O-61-11	None	Ag, Cu, Mg	Ag, Cu	Cu	All less Ti, steel
O-62-13		None	None	None	Ti
O-64-2		None	None	None	Steel
O-64-12		Mg	All less Cu	Al, Ti, Mg	All less Cu
O-64-16			None	All	Al, Ti, Ag
O-65-27			Mg		

Significant weight gain, as used here, is defined as a specimen weight gain of 0.20 mg/cm² or more.

Oxidation-corrosion test data are given in Table 7 on the effect of condensate return. Viscosity and neutralization number results are compared for both test methods. A large majority of the lubricants examined in this study were unaffected by the reflux procedure. However, some fluids showed a marked effect, and the technique served both to improve or worsen performance depending on oil type. Lubricants O-62-4, O-62-6, O-65-18, O-65-27, and O-65-28 showed increased oxidative stability when run with the reflux procedure. The use of condensate return had a deleterious effect on the performance of O-62-16 and O-65-21. For all lubricants mentioned, the effect was consistently reflected by the sample properties of viscosity and acidity. A seemingly unusual phenomenon, however, was indicated for O-65-19. Viscosity data for this oil showed no effect for refluxing. Sample neutralization number, however, gave almost an eightfold increase in the reflux determination. This result is assumed to be a unique characteristic of the lubricant.

It is interesting to note that of the six MIL-L-23699 type lubricants included in this work none was affected by the reflux method. All of the lubricants which were one way or another susceptible to vapor refluxing were of the MIL-L-7808 type.

Metal specimen corrosion data in the reflux determinations were generally unchanged from the results shown in nonreflux tests, but with two exceptions. Lubricant O-65-21, which gave no significant metal attack in nonreflux oxidation-corrosion tests, showed weight losses of 0.27 and 0.73 mg/cm² for copper and magnesium, respectively. The lubricant was of the group which likewise showed increased deterioration of oil properties using condensate return. Similarly, O-65-28 indicated a copper weight loss of -0.40 mg/cm² in the reflux test, but the metal was unaffected using the non-reflux procedure.

C. Results on Lubricant Blends

At the direction of AFAPL, six lubricant blends were prepared and evaluated in oxidation-corrosion tests under specified conditions. The blends consisted of equal parts by volume of selected lubricants previously examined in the program. Two of the mixtures, J-1003 and J-1007, were composed of MIL-L-7808 type lubricants while the other four were blends of MIL-L-23699 type lubricants (Table 1).

Table 8 presents viscosity increase results on the oil mixtures. The blends are grouped in the table with their respective constituent oils. In general, no unusual effects were noted in this work. The 375°F test results on J-1003 showed no deleterious effect attributable to any incompatibility of the three constituents. In fact, viscosity data for the blend were very close to the arithmetical average of results obtained with the individual oils. The performance of J-1003 was further investigated by a test employing moist

TABLE 7. OXIDATION-CORROSION TEST RESULTS ON THE
EFFECT OF CONDENSATE RETURN AT 385°F

OH Code	100°F Vis Increase, % at 48 hr		48-hr NN, mg KOH/g	
	Nonreflux	Reflux	Nonreflux	Reflux
O-62-3	72	71(a)	1.21	1.10(a)
O-62-4	107(a)	79	1.70(a)	1.14
O-62-6	122(b)	54(a)	8.75(b)	7.90(a)
O-62-16	70	110	13.96	21.9
O-63-16	170	153	1.14	1.17
O-64-2	19	18	0.38	0.31
O-64-13	24	23	0.10	0.04
O-64-22	10	10	0.41	0.46
O-64-25	11	10(a)	0.15	0.15(a)
O-64-26	109	106	0.41	0.47
O-65-1	532	639	26.2	29.2
O-65-2	50	51	0.09	0.06
O-65-3	319	271	2.01	1.83
O-65-4	16	15	0.50	0.45
O-65-5	31	32	0.30	0.31
O-65-8	8(a)	8	0.21(a)	0.21
O-65-14	577	452	20.9	30.7
O-65-15	16	16	0.45	0.45
O-65-16	16	16	0.54	0.59
O-65-18	148	129	1.85	1.68
O-65-19	59	48	1.29	10.49
O-65-21	76	174	1.25	26.4
O-65-23	141	148	0.84	0.86
O-65-24	34	30	0.64	0.62
O-65-27	1768	226	3.48	2.27
O-65-28	12,650	6559	21.8	18.75
O-65-31	59	58	0.65	0.65

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

TABLE 8. VISCOSITY INCREASE DATA ON LUBRICANT
BLENDS AND BLEND CONSTITUENTS

Oil Code	100°F Vis Increase, %, for Test at		
	375°F,	385°F	
	<u>Nonreflux</u>	<u>Nonreflux</u>	<u>Reflux</u>
65-L-114	27		
65-L-115	1		
65-L-116	17		
J-1003	23		
J-1003	21(a)		
O-62-3		72	72(c)
O-62-6		122(b)	54(c)
J-1007		96	84(c)
O-64-13		24	23
O-64-25		11	10(c)
J-1011		18	19
O-64-2			18
O-64-13			23
J-1020			19
O-64-2			18
O-64-25			10(c)
J-1021			14
O-64-2			18
O-64-13			23
O-64-25			10(c)
J-1025			15

(a) Test performed with water-saturated air.

(b) Average of triplicate determinations.

(c) Average of duplicate determinations.

air, rather than dry air as normally used. The air was passed through a diffuser stone submerged in distilled water prior to entering the test tube. The results of this run, however, did not differ in any aspect from those obtained in the dry air test. The trend exhibited by J-1003 was characteristic of all other blends except for J-1007. The nonreflux determination on this mixture demonstrated the expected effect, i. e., blend performance was rated between that of its constituents. In contrast, the J-1007 run with condensate return indicated a slight adverse effect, i. e., viscosity increase indicated a level of degradation more severe than that obtained for either of the two constituents. This effect is not considered to be too significant, however, as the value obtained for the blend was well within the repeatability variation of the constituent lubricant O-62-3.

Neutralization number data are given in Table 9 for the tests performed on the lubricant mixtures. These results confirmed the effects demonstrated by viscosity with the exception of blend J-1007. The blend acidity value, in both reflux and nonreflux tests, was very close to that for the lower of the two constituents, viz., O-62-3. In the case of the reflux test, this effect is in direct contradiction with the deterioration profile shown by viscosity data for J-1007.

Metal specimen data obtained in the blend experiments showed no evidence of lubricant incompatibility with respect to metal attack. In other words, none of the lubricant blends indicated metal corrosion which had not been previously noted for one of the blend constituents. The results do, however, provide an indication of the predominating influence of the individual lubricants. J-1003, for example, showed no evidence of metal corrosion at 375°F although one of its constituents, 65-L-115, gave significant copper corrosion. Similarly, J-1007 indicated no specimen attack with or without refluxing, whereas O-62-6 corroded copper. Significant metal corrosion for the MIL-L-23699 blends is given here for the 385°F reflux determinations:

Constituent Oils			Blended Oils			
<u>O-64-2</u>	<u>O-64-13</u>	<u>O-64-25</u>	<u>J-1011</u>	<u>J-1020</u>	<u>J-1021</u>	<u>J-1025</u>
	Cu	None	Cu			
None	Cu			None		
None		None			None	
None	Cu	None				None

Lubricant O-64-13 exhibited the predominating effect in the J-1011 blend since both tests showed copper corrosion, although O-64-25 did not when tested singly. Similar performance was observed in the nonreflux tests on these fluids. When O-64-13 was blended with O-64-2, however, the resultant mixture did not give copper attack in the oxidation-corrosion test. Further, an equal-part mixture (J-1025) of all three lubricants likewise showed no metal corrosion.

TABLE 9. NEUTRALIZATION NUMBER DATA ON LUBRICANT BLENDS AND BLEND CONSTITUENTS

Oil Code	48-hr NN, mg KOH/g, for Test at		
	375° F,	385° F	
	Nonreflux	Nonreflux	Reflux
65-L-114	0.83		
65-L-115	0.83		
65-L-116	0.98		
J-1003	0.84		
J-1003	0.89(a)		
O-62-3		1.21	1.10(c)
O-62-6		8.75(b)	7.90(c)
J-1007		1.47	1.34(c)
O-64-13		0.10	0.04
O-64-25		0.15	0.15(c)
J-1011		0.08	0.11
O-64-2			0.31
O-64-13			0.04
J-1020			0.15
O-64-2			0.31
O-64-25			0.15(c)
J-1021			0.29
O-64-2			0.31
O-64-13			0.04
O-64-25			0.15(c)
J-1025			0.17

(a) Test performed with water-saturated air.

(b) Average of triplicate determinations.

(c) Average of duplicate determinations.

SECTION V

CONCLUSIONS

Using a 48-hour nonreflux oxidation-corrosion test procedure, 46 test lubricants were evaluated at one or more temperatures within the range of 350 to 400°F. Relatively mild oxidative degradation occurred at 350 and 375°F. At 400°F, lubricant deterioration was very severe with only four out of 16 of the lubricants tested giving satisfactory performance. Consequently, the major testing effort was confined to the temperatures of 385 and 390°F. The 385°F series indicated 23 satisfactory lubricants out of 37 examined. At 390°F, 16 lubricants passed from among a total of 29 tested.

Several duplicate determinations were made to verify the repeatability of the test procedure. The agreement of data was good in all cases except at very high levels of lubricant deterioration, where wide variability of data is normally anticipated.

Metal specimen condition in the nonreflux determinations indicated corrosion almost exclusively of copper and magnesium with several oils. The severity and frequency of attack increased with increasing test temperature. Similarly, the occurrence of specimen deposits was more frequently noted at the higher temperatures investigated. In the latter case, however, all metal types were susceptible to deposit formation. A cursory study to evaluate the applicability of a specimen electrocleaning technique showed essentially no difference for metal weight data. It is felt that a more significant effect would have been obtained on specimens which sustained visible deposits.

Results on the effect of condensate return at 385°F revealed that a large majority of the 19 lubricants tested were unaffected. Lubricants O-62-4 and O-62-6, however, showed improved performance in reflux tests, whereas O-62-16 and O-65-21 were less stable. Lubricant O-65-19 indicated no change in viscosity data between the reflux and nonreflux runs, but gave a substantially higher neutralization number in the reflux determination. None of the MIL-L-23699 type fluids was affected by vapor refluxing.

Six lubricant blends incorporating various combinations of eight individual lubricants were examined in this work. Oxidation-corrosion test results indicated no significant incompatibility of lubricant constituents. Blend J-1007 (mixture of O-62-3 and O-62-6) in a vapor reflux test indicated a slight adverse effect in that the deterioration, as noted by viscosity increase, was more severe than that of either of its constituents. However, this effect is not considered to be conclusive since the value obtained for the blend was within the repeatability range of the constituent lubricant O-62-3. Sample neutralization number of this blend followed that of O-62-3, the lower acidity value of the two constituents.

APPENDIX
DETAILED OXIDATION-CORROSION TEST DATA

TABLE 10. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 at 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss,		Overhead Sample	
					Wt, g	wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.12	--	4.20	0.18	--			
16 hr	17.38	7.8	4.29	0.38	18.8			
24 hr	18.06	12.0	4.62	0.36	27.6			
40 hr	19.38	26.4	5.08	0.36	45.5			
48 hr	22.61	40.3	5.52	0.49	53.5	34	0.73	9.60

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.06			
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	None
	Cu	+0.02			
	Mg	-0.06			
				At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	350
Ti	Lt tan		200
Ag	Lt yellow		130
Steel	Blue		No
Cu	Lt green		
Mg	NC	Condensate return	

TABLE 11. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss,		Overhead Sample	
					Wt, g	wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.12	--	4.20	0.18				
16 hr (a)	18.01	11.7	4.58	0.50	30.6			
24 hr	19.75	22.5	4.94	0.54	46.2			
40 hr	27.60	71.2	6.44	0.65	75.2			
48 hr	39.43	145	8.51	1.08	88.0	52	0.90	9.65

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.04	Sludge in Oil:	200-mesh filter	None
	Ti	-0.04		Centrifuge	Trace
	Ag	+0.06			
	Steel	+0.20	Tube deposits:	Below oil level	None
	Cu	0.0		At and above oil level	None
	Mg	+0.16			

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	375
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Dark blue	Condensate return	No
Cu	NC		
Mg	NC		

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 12. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F	
Initial	16.12	--	4.20	0.18	--				
16 hr	18.89	17.2	4.80	0.45	42.1				
24 hr	21.74	34.9	5.34	0.59	63.0				
40 hr	41.29	156	8.71	1.13	96.6				
48 hr	79.03	390	14.29	1.67	101.3	60	1.14		9.66
Metal Specimen Data					Test Cell Data				
Weight change, mg/cm ² :					Al	+0.02	Sludge in oil:	200-mesh filter	None
					Ti	+0.04		Centrifuge	(a)
					Ag	+0.06	Tube deposits:	Below oil level	None
					Steel	+0.08		At and above oil level	None
					Cu	-0.08			None
					Mg	+0.02			
Metal discoloration, deposits, pitting, or etching:									
Al					NC				
Ti					Brown				
Ag					Lt yellow				
Steel					Blue-green				
Cu					Lt pink				
Mg					NC				
					Sample temperature, °F				
					Sample Volume, ml				
					Air rate, liter/hr				
					Condensate return				
					385				
					200				
					130				
					No				

(a) Insufficient sample.

TABLE 13. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 at 390 °F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.20	0.18	--			
16 hr	22.0	4.90	0.54	50.8			
24 hr	47.6	5.70	0.73	75.9			
40 hr	273	11.40	1.67	105.4	65	1.39	9.68
48 hr	482	16.14	1.68	106.1			
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag				Tube deposits: Below oil level			
Steel				At and above oil level			
Cu							
Mg							
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu							
Mg							

(a) Insufficient sample.

TABLE 14. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 400°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.20	0.18	--			
16 hr	23.9	4.98	0.91	57.7			
24 hr	97.1	6.35	18.35	91.4			
40 hr	--	--	25.4	113.3			
48 hr	--	--	--	--	71	10.44	9.69
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	(a)	
		Ti	-0.02		Centrifuge	(a)	
		Ag	+0.10	Tube Deposits: Below oil level			
		Steel	+0.02	At and above oil level			
		Cu	-7.6			Med var	
		Mg	-0.34			Med var	
<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>					
Al		NC		Sample temperature, °F		400	
Ti		Lt blue		Sample Volume, ml		200	
Ag		NC		Air rate, liter/hr		130	
Steel		Blue-green		Condensate return		No	
Cu		Severe etching					
Mg		Slight pitting					

(a) Test terminated at 40 hr, sample gelled.

TABLE 15. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	12.73	4.9	3.27	0.30	13.6			
24 hr	13.03	7.4	3.37	0.36	19.3			
40 hr	13.32	9.8	3.45	0.40	31.0			
48 hr	13.30	9.6	3.40	0.42	36.5	23	1.36	10.75

Metal Specimen Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.10 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Med var
	Cu		At and above oil level	None
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Al	Lt brown
Ti	Lt tan
Ag	Lt yellow
Steel	Hvy varnish
Cu	Lt brown
Mg	Grey

Test Conditions

Sample temperature, °F	350
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 16. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 375°F

Sample Data		Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt%	Overhead Sample	
								Acidity, mg KOH/g	Vis, cs/100°F
Initial		12.13	--	3.17	0.19	--			
16 hr (a)		13.08	7.8	3.36	0.56	22.9			
24 hr		13.21	8.9	3.44	0.61	33.9			
40 hr		14.08	16.1	3.55	0.61	55.2			
48 hr		13.92	14.3	3.51	0.73	65.0	39	1.81	11.00
Metal Specimen Data		Test Cell Data							
Weight change, mg/cm ² :		Al		+0.26		Sludge in oil:	200-mesh filter		None
		Ti		+0.24			Centrifuge		0.05 ml/25
		Ag		+0.26		Tube deposits:	Below oil level		Med carbon
		Steel		+0.36			At and above oil level		Med carbon
		Cu		+0.20					
		Mg		+0.45					
Metal discoloration, deposits, pitting, or etching:		Al		Lt brown		Test Conditions			
		Ti		Tan		Sample temperature, °F			375
		Ag		Lt carbon		Sample volume, ml			200
		Steel		Hvy varnish		Air rate, liter/hr			130
		Cu		Lt varnish		Condensate return			No
		Mg		Lt carbon					

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 17. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
								Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--		3.17	0.19	--			
16 hr	13.47	11.0		3.48	0.65	31.2			
24 hr	13.72	13.1		3.52	0.72	46.5			
40 hr	14.52	19.7		3.63	0.93	73.8			
48 hr	15.19	25.2		3.65	1.10	85.0	50	2.33	11.21

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.22	Sludge in oil:	200-mesh filter	None
	Ti	+0.22		Centrifuge	1.00 ml/25
	Ag	+0.24			
	Steel	+0.28	Tube deposits:	Below oil level	Lt carbon
	Cu	+0.22		At and above oil level	Lt carbon
	Mg	+0.23			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Med carbon			
Ti	Med carbon	Sample temperature, °F		385
Ag	Med carbon	Sample volume, ml		200
Steel	Med carbon	Air rate, liter/hr		130
Cu	Med carbon	Condensate return		No
Mg	Med carbon			

TABLE 18. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 390°F

<u>Sample Data</u>						<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.17	0.11	--				
16 hr	13.7	3.52	0.77	39.5				
24 hr	14.28	3.49	0.76	57.3				
40 hr	15.73	3.75	1.17	88.8				
48 hr	18.31,	3.98	1.65	99.5	58	1.94	11.35	
6.01(a)	32.0(a)							
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>						
Weight change, mg/cm ² :		Al	+0.45	Sludge in oil:	200-mesh filter	None		
		Ti	+0.36		Centrifuge	1.95 ml/25		
		Ag	+0.18					
		Steel	+0.26	Tube deposits:	Below oil level	Lt carbon		
		Cu	+0.24		At and above oil level	Lt carbon		
		Mg	+0.30					
<u>Metal discoloration, deposits, bitting, or etching:</u>		<u>Test Conditions</u>						
		Al	Med carbon					
		Ti	Med carbon	Sample temperature, °F		390		
		Ag	Med carbon	Sample volume, ml		200		
		Steel	Med carbon	Air rate, liter/hr		130		
		Cu	Med carbon	Condensate return		No		
		Mg	Med carbon					

(a) Value obtained after centrifuging sample.

TABLE 19. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 390°F

Sample Date

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. Nc., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.68	12.8	3.42	0.74	37.2			
24 hr	13.87	14.5	3.49	0.91	54.8			
40 hr	14.96	23.3	3.73	1.20	86.6			
48 hr	15.91	31.2	3.69	1.64	99.1	55	2.73	11.23

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.10	Sludge in oil:	200-mesh filter	None
	Ti	+0.10		Centrifuge	1.00 ml/25
	Ag	+0.14			
	Steel	+0.12	Tube deposits:	Below oil level	Lt carbon
	Cu	+0.10		At and above oil level	Lt carbon
	Mg	+0.12			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon				390°F
Ti	Lt carbon				200
Ag	Lt carbon				130
Steel	Lt carbon				No
Cu	Lt carbon				
Mg	Lt carbon				

TABLE 20. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.78	13.6	3.51	1.02	46.1			
24 hr	13.97	15.2	3.53	1.14	67.6			
40 hr	16.61	36.9	4.03	2.09	104.2			
48 hr	(a)	--	(a)	(a)	114.8	66	2.99	11.48

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.67	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.53		Centrifuge	(a)
	Ag	+0.45			
	Steel	+0.61	Tube deposits:	Below oil level	Med carbon
	Cu	+0.08		At and above oil level	Med carbon
	Mg	+0.57			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon
Ti	Lt carbon
Ag	Lt carbon
Steel	Lt carbon
Cu	Lt carbon
Mg	Lt carbon

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Insufficient sample.

TABLE 21. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.80	13.8	3.45	0.98	46.8			
24 hr	14.45	19.1	3.64	1.20	67.4			
40 hr	16.91	39.4	3.83	1.86	103.3			
48 hr	(a)	--	(a)	(a)	113.0	67	3.09	11.49

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	(a)
	Ti		Centrifuge	(a)
	Ag	Tube deposits: Below oil level Med carbon		
	Steel			
	Cu			
	Mg	At and above oil level Med carbon		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon	Sample temperature, °F	400
Ti	Lt carbon	Sample volume, ml	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Lt carbon	Condensate return	No
Cu	Lt carbon		
Mg	Lt carbon		

(a) Insufficient sample.

(b) Weight error suspected.

TABLE 22. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-61-11 at 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	16.51	5.4	4.29	0.82	14.3			
24 hr	16.98	8.4	4.38	0.85	20.5			
40 hr	17.92	14.4	4.58	0.84	32.7			
48 hr	18.68	19.2	4.79	0.83	38.2	28	1.90	10.63

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.10	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	+0.18			
	Steel	+0.06	Tube deposits:	Below oil level	None
	Cu	+0.16		At and above oil level	None
	Mg	+0.16			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Brown		Sample temperature, °F	350
Ti	Lt blue		Sample volume, ml	200
Ag	Brown		Air rate, liter/hr	130
Steel	Lt brown		Condensate return	No
Cu	Dark brown			
Mg	Brown			

TABLE 23. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 375°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.11	0.39	--			
16 hr (a)	8.0	4.52	0.90	24.7			
24 hr	13.0	4.56	0.90	36.3			
40 hr	29.1	5.14	0.76	57.9			
48 hr	44.2	5.63	0.85	66.7	43	2.05	10.77
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Sludge in oil: 200-mesh filter					
		Centrifuge					
		Tube deposits: Below oil level					
		At and above oil level					
		Lt var					
		Lt var					
<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>					
Al		Brown					
Ti		Lt blue					
Ag		Lt carbon					
Steel		Peacock					
Cu		Lt carbon					
Mg		Hvy varnish					
		Sample temperature, °F					
		Sample volume, ml					
		Air rate, liter/hr					
		Condensate return					
		No					

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 24. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.54	11.9	4.50	0.87	38.0			
24 hr	18.85	20.3	4.80	0.89	55.1			
40 hr	24.34	55.3	5.99	0.89	82.0			
48 hr	34.21	118	8.19	1.38	90.5	54	2.03	11.08

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.06		Centrifuge	Trace
	Ag	+0.24			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	+0.26		At and above oil level	Lt var
	Mg	+0.12			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	
Ti	Lt green	Sample temperature, °F 385
Ag	Brown	Sample volume, ml 200
Steel	Green-red	Air rate, liter/hr 130
Cu	Lt carbon	Condensate return No
Mg	Brown	

TABLE 25. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-61-11 AT 385°F

Sample Data

	Vis, cs/100°F	100°F V _{vis} Increase, %	Vis, cs/10°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.38	10.9	4.47	0.91	35.2			
24 hr	18.50	18.1	4.75	0.91	51.2			
40 hr	22.9	46.3	5.70	0.91	78.7			
48 hr	29.59	88.4	7.09	1.17	88.8	60	2.29	10.98

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.08
	Ti	+0.02
	Ag	+0.02
	Steel	+0.47
	Cu	+0.26
	Mg	+0.12

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt brown
Ti	Lt green
Ag	Brown
Steel	Lt green
Cu	Lt carbon
Mg	Lt carbon

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 26. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.67	12.8	4.53	0.91	42.5			
24 hr	19.18	22.4	4.85	0.98	61.0			
40 hr	26.25	67.5	6.41	1.13	91.6			
48 hr	42.51	171	9.81	1.79	100.6	62	2.05	11.25

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	(a)
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	Sample temperature, °F	390
Ti	Lt blue	Sample volume, ml	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Red-purple	Condensate return	No
Cu	Lt carbon		
Mg	Brown		

(a) Insufficient sample.

TABLE 27. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.53	11.9	4.50	0.96	39.7			
24 hr	18.89	20.5	4.79	0.99	57.0			
40 hr	25.20	60.8	6.12	1.09	86.9			
48 hr	36.89	135	8.72	1.59	96.5	60	2.40	11.20

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.04	Sludge in oil: 200-mesh filter Centrifuge	Nore (a)
	Ti	-0.04		
	Ag	-0.22		
	Steel	-0.04		
	Cu	+0.20		
	Mg	+0.08	Tube deposits: Below oil level At and above oil level	Lt var Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown
Ti	Lt blue
Ag	Brown
Steel	Blue-red
Cu	Lt carbon
Mg	Lt brown

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Insufficient sample.

TABLE 28. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.73	13.1	4.57	1.06	47.9			
24 hr	19.44	24.1	4.49	1.14	68.9			
40 hr	28.56	82.2	6.93	1.71	103.0			
48 hr	(a)	--	(a)	(a)	111.8	68	2.46	11.37

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.20	Sludge in oil: 200-mesh filter	(a)
	Ti	0.0	Centrifuge	(a)
	Ag	+0.28		
	Steel	0.0	Tube deposits: Below oil level	Lt var
	Cu	+0.34	At and above oil level	Lt var
	Mg	+0.20		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	Sample temperature, °F	400
Ti	Lt blue	Sample volume, ml	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Peacock	Condensate return	No
Cu	Lt carbon		
Mg	Brown		

(a) Insufficient sample.

TABLE 29. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	16.63	7.2	4.03	0.27	12.7			
24 hr	17.18	10.8	4.12	0.36	17.9			
40 hr	18.57	19.7	4.38	0.44	26.7			
48 hr	19.48	25.6	4.54	0.52	30.6	23	1.14	8.79

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	None
	Ag	0.0			
	Steel	+0.06	Tube deposits:	Below oil level	None
	Cu	-0.08		At and above oil level	None
	Mg	+0.10			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	350
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Lt brown	Condensate return	No
Cu	Lt tan		
Mg	NC		

TABLE 30. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr (a)	16.85	8.6	4.05	0.48	9.5			
24 hr	17.78	14.6	4.22	0.57	18.8			
40 hr	20.68	33.3	4.70	0.69	37.0			
48 hr	22.87	47.5	5.06	0.86	43.3	34	1.38	8.97

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.04		Centrifuge	None
	Ag	+0.08	Tube deposits:	Below oil level	Ncne
	Steel	+0.08		At and above oil level	None
	Cu	-0.14			
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Lt brown
Ag	Lt yellow
Steel	Blue
Cu	Brown
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 31. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt, %	Overhead Sample Acidity, mg KOH/g	cs/100°F
Initial	15.51	--	3.84	0.02	--	--		
16 hr	17.46	12.6	4.15	0.58	18.6			
24 hr	18.95	22.2	4.40	0.67	32.5			
40 hr	23.40	50.9	5.42	0.94	52.9			
48 hr	26.72	72.3	5.64	1.21	57.6	42	1.62	9.09

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.02
	Ti	+0.02
	Ag	0.0
	Steel	+0.02
	Cu	-0.18
	Mg	+0.04

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Brown
Mg	NC
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	NC

TABLE 32. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

<u>Sample Data</u>						
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/120°F	Neut. No., mg KOH/g	Oil Loss, wt %	
Initial	15.51	--	3.84	0.02		
16 hr	17.54	13.1	4.16	0.53		
24 hr	18.91	21.9	4.32	0.65		
40 hr	23.26	50.0	5.10	0.91		
48 hr	26.15	68.6	5.59	1.08		43
<u>Metal Specimen Data</u>			<u>Test Cell Data</u>			
Weight change, mg/cm ² :			Al	Sludge in oil:	200-mesh filter	None
		Ti	+0.10		Centrifuge	Trace
		Ag	0.0	Tube deposits: Below oil level None At and above oil level None		
		Steel	+0.02			
		Cu	0.0			
		Mg	+0.06			
Metal discoloration, deposits, pitting, or etching:			<u>Test Conditions</u>			
		Al	Lt brown	Sample temperature, °F		
		Ti	Brown	Sample volume, ml		
		Ag	Yellow	Air rate, liter/hr		
		Steel	Blue	Condensate return		
		Cu	Purple			
		Mg	Lt yellow			

TABLE 33. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., Mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	15.51	--	3.84	0.02	
16 hr	17.61	13.5	4.18	0.58	
24 hr	19.15	24.0	4.45	0.63	
40 hr	23.57	51.9	5.14	0.91	
48 hr	26.83	73.0	5.65	1.12	43

Metal Specimen Data

<u>Weight change, mg/cm²:</u>	<u>Al</u>	<u>0.0</u>	<u>Sludge in oil:</u>	<u>200-mesh filter</u>	<u>None</u>
	Ti	+0.02		Centrifuge	None
	Ag	+0.02			
	Steel	+0.04			
	Cu	-0.14			
	Mg	+0.04			
			<u>Tube deposits:</u>	<u>Below oil level</u>	<u>None</u>
				<u>At and above oil level</u>	<u>Lt var</u>

Metal discoloration, deposits,
pitting, or etching:

<u>Al</u>	<u>Lt yellow</u>
<u>Ti</u>	<u>Brown</u>
<u>Ag</u>	<u>Yellow</u>
<u>Steel</u>	<u>Blue</u>
<u>Cu</u>	<u>Blue-brown</u>
<u>Mg</u>	<u>Lt yellow</u>

Test Conditions

<u>Sample temperature, °F</u>	<u>385</u>
<u>Sample volume, ml</u>	<u>200</u>
<u>Air rate, liter/hr</u>	<u>130</u>
<u>Condensate return</u>	<u>Yes</u>

TABLE 34. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 390°F

Sample Data

	Vis, cs/100°F	100, F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	17.71	14.2	4.20	0.60	19.0			
24 hr	19.60	26.4	4.49	0.73	35.2			
40 hr	25.15	62.2	5.36	1.17	55.9			
48 hr	28.73	85.2	5.89	1.63	59.7	46	2.13	9.23

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	None
	Ag	+0.02			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.20		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC
Ti	Brown
Ag	NC
Steel	Blue
Cu	Blue-red
Mg	Lt yellow

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 35. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 390°F

Sample Data		Test Cell Data					Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.84	0.02	--				
16 hr	16.4	4.27	0.59	33.5				
24 hr	28.4	4.55	0.79	50.1				
40 hr	25.42	5.35	1.03	71.7				
48 hr	29.03	5.93	1.19	77.0	48	2.05	11.25	
Metal Specimen Data		Test Cell Data						
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter	None	
		Ti	-0.02			Centrifuge	None	
		Ag	0.0					
		Steel	0.0	Tube deposits:		Below oil level	Lt var	
		Cu	-0.22			At and above oil level	Lt var	
		Mg	+0.02					
Metal discoloration, deposits, pitting, or etching:		Test Conditions						
		Al	Lt tan	Sample temperature, °F		390		
		Ti	Brown	Sample volume, ml		200		
		Ag	Yellow	Air rate, liter/hr		130		
		Steel	Blue	Condensate return		No		
		Cu	Brown-red					
		Mg	NC					

TABLE 36. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	18.73	20.8	4.38	0.73	41.4			
24 hr	21.08	35.9	4.74	1.03	58.8			
40 hr	47.15	204	7.71	10.01	81.3			
48 hr	107.1	590	13.75	12.84	83.4	54	5.27	9.19

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.12	Sludge in oil:	200-mesh filter	None
	Ti	+0.08		Centrifuge	None
	Ag	-0.04			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.40		At and above oil level	None
	Mg	-0.22			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Blue
Ag	NC
Steel	Green
Cu	Slight etching
Mg	Slight etching

Test Conditions

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 37. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 400°F

Sample Data								Overhead Sample	
Vis, cs/190°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	---	3.94	0.02	---					
16 hr	20.4	4.35	0.84	42.7					
24 hr	36.9	4.74	1.00	61.4					
40 hr	86.7	5.82	2.55	83.0					
48 hr	184	7.63	7.27	86.3	52	2.34	9.21		
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter					
Al				Centrifuge					
Ti				None					
Ag				Trace					
Steel				None					
Cu				None					
Mg				None					
				Tube deposits: Below oil level					
				At and above oil level					
				None					
				None					
Metal discoloration, deposits, pitting, or etching.				Test Conditions					
Al				Sample temperature, °F					
Ti				Sample volume, ml					
Ag				Air rate, liter/hr					
Steel				Condensate return					
Cu				No					
Mg				No					

(a) Weight error suspected.

TABLE 38. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 350°F

<u>Sample Data</u>					<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.93	0.11	--			
16 hr	5.1	4.10	0.61	14.6			
24 hr	6.8	4.14	0.63	21.0			
40 hr	12.7	4.35	0.56	34.3			
40 hr	16.7	4.49	0.62	40.2	27	1.39	10.65
<u>Metal Specimen Data</u>					<u>Test Cell Data</u>		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al					Centrifug.		
Ti							
Ag							
Steel					Tube deposits: Below oil level		
Cu					At and above oil level		
Mg					None		
Metal discoloration, deposits, pitting, or etching:					<u>Test Conditions</u>		
Al					Sample temperature, °F		
Ti					Sample volume, ml		
Ag					Air rate, liter/hr		
Steel					Condensate return		
Cu							
Mg							

TABLE 39. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 375°F

Sample Data		Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.93	0.11	--			
16 hr (a)	7.2	4.15	0.84	24.1			
24 hr	11.6	4.29	0.82	35.7			
40 hr	25.3	4.78	0.95	55.4			
48 hr	43.3	5.37	1.23	68.4	42	1.66	10.85
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	Sludge in oil:		200-mesh filter	None	
		Ti			Centrifuge	0.40 ml/25	
		Ag					
		Steel	Tube deposits:		Below oil level	None	
		Cu			At and above oil level	Lt var	
		Mg					
Metal discoloration, deposits, pitting, or etching:		Al	Test Conditions				
		Ti	Sample temperature, °F			375	
		Ag	Sample volume, ml			200	
		Steel	Air rate, liter/hr			130	
		Cu	Condensate return			No	
		Mg					

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 40. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

Sample Data									
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	15.01	--	3.93	0.11	--				
16 hr	16.48	9.8	4.24	0.88	34.9				
24 hr	17.41	16.0	4.17	0.82	51.9				
40 hr	21.73	44.8	4.52	0.99	84.1				
48 hr	30.22	101	7.55	1.45	96.6	58	1.68	11.06	
Test Cell Data									
Metal Specimen Data									
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter	None		
		Ti	+0.02			Centrifuge	(a)		
		Ag	+0.04						
		Steel	+0.06			Tube deposits:	Below oil level	Lt var	
		Cu	-0.04				At and above oil level	Lt var	
		Mg	+0.02						
Test Conditions									
Metal discoloration, deposits, pitting, or etching:			Pink	Sample temperature, °F			385		
			Pink	Sample volume, ml			700		
			Lt pink	Air rate, liter/hr			130		
			Green	Condensate return			No		
			Orange						
			Tan						

(a) Insufficient sample.

TABLE 41. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

Sample Data							Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.93	0.11	--				
16 hr	9.7	4.26	0.84	34.2				
24 hr	15.5	4.45	0.90	50.5				
40 hr	45.1	5.43	1.26	81.1				
48 hr	113	7.63	1.95	92.5	55	1.69	10.98	
Metal Specimen Data		Test Cell Data						
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:		200-mesh filter		
		Ti	+0.02			Centrifuge		
		Ag	+0.06					
		Steel	+0.06	Tube deposits:		Below oil level		
		Cu	-0.02			At and above oil level		
		Mg	0.0			Lt var		
Metal discoloration, deposits, pitting, or etching:		Al	Lt pink			Lt var		
		Ti	Tan	Sample temperature, °F		385		
		Ag	Lt pink	Sample volume, ml		200		
		Steel	Green	Air rate, liter/hr		130		
		Cu	Orange	Condensate return		No		
		Mg	NC					

(a) Insufficient sample.

TABLE 42. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

<u>Sample Data</u>					
	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	15.01	--	3.93	0.39	
16 hr	16.43	9.5	4.24	0.86	
24 hr	17.29	15.2	4.37	0.86	
40 hr	20.80	38.6	5.23	0.91	
48 hr	26.93	79.4	6.56	1.14	54
<u>Metal Specimen Data</u>					
<u>Weight change, mg/cm²:</u>					
Al	+0.04				
Ti	0.0				
Ag	+0.02				
Steel	0.0				
Cu	-0.04				
Mg	+0.04				
<u>Metal discoloration, deposits, pitting, or etching:</u>					
Al	Lt yellow				
Ti	Lt brown				
Ag	Lt yellow				
Steel	Green-blue				
Cu	Brown				
Mg	Lt yellow				
<u>Test Cell Data</u>					
<u>Sludge in oil:</u>			200-mesh filter		
			Centrifuge		
<u>Tube deposits:</u>			Below oil level		
			At and above oil level		
			Med var		
			Lt carbon		
<u>Test Conditions</u>					
<u>Sample temperature, °F</u>			385		
<u>Sample volume, ml</u>			200		
<u>Air rate, liter/hr</u>			130		
<u>Condensate return</u>			Yes		

TABLE 43. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.01	--	3.93	0.11	--			
16 hr	16.70	11.3	4.20	0.81	39.3			
24 hr	17.80	18.6	4.54	1.05	57.7			
40 hr	24.09	60.5	5.91	1.19	91.3			
48 hr	51.19	241	11.39	2.22	103.6	62	1.78	11.13

Metal Specimen Data

Weight change, mg/cm ² :	Al	Ti	Ag	Steel	Cu	Mg
	0.0	-0.02	+0.02	+0.04	-0.08	+0.04
Sludge in oil:	200-mesh filter	Centrifuge				
Tube deposits:	Below oil level	At and above oil level				
	None	(a)		Lt var	Lt var	

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt purple	Sample temperature, °F	390
Ti	Brown	Sample volume, ml	200
Ag	Lt pink	Air rate, liter/hr	130
Steel	Green	Condensate return	No
Cu	Pink-brown		
Mg	Lt yellow		

(a) Insufficient sample.

TABLE 44. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 400°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.93	0.11	--			
16 hr	11.7	4.38	1.03	45.7			
24 hr	20.6	4.63	1.14	67.6			
40 hr	128	8.00	2.49	105.6			
48 hr	--	(a)	(a)	106.8	64	1.94	11.27
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti				(a)			
Ag							
Steel				Tube deposits: Below oil level Med var			
Cu				At and above oil level Med var			
Mg							
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Lt pink			
Ti				Lt brown			
Ag				Lt yellow			
Steel				Green			
Cu				Slight pitting			
Mg				NC			
				Sample temperature, °F			
				Sample volume, ml			
				Air rate, liter/hr			
				Condensate return			
				400			
				200			
				130			
				No			

TABLE 45. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.79	--	4.70	0.24	--			
16 hr	18.58	4.4	4.86	0.53	15.0			
24 hr	19.17	7.8	5.01	0.55	21.9			
40 hr	20.68	16.2	5.31	0.56	35.3			
48 hr	21.87	22.9	5.61	0.58	41.4	28	1.54	10.54

Metal Specimen Data

Weight change, mg/cm ² :		Test Cell Data	
Metal discoloration, deposits, pitting, or etching:	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifuge
	Ag		
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		None

Test Conditions	
Sample temperature, °F	350
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 46. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-62-6 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt g	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.79	--	4.70	0.24	--			
16 hr (a)	19.18	7.8	4.97	0.66	25.0			
24 hr	20.48	15.1	5.27	0.70	37.3			
40 hr	24.57	38.1	6.20	0.77	60.8			
48 hr	29.65	66.7	7.32	0.90	70.7	42	1.67	10.69

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifuge
	Ag		
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		Lt var

Metal discoloration, deposits,
pitting, or etching:

<u>Test Conditions</u>	
Al	Grey
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Yellow-green
Mg	NC
Sample temperature, °F	
Sample volume, ml	
Air rate, liter/hr	
Condensate return	
	375
	200
	130
	No

(a) A gradual 5°F drop in sample temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 47. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data				Test Cell Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F				
Initial	--	4.70	0.24	--							
16 hr	1.1	5.07	0.75	33.6							
24 hr	18.7	5.42	0.82	49.2							
40 hr	47.3	6.49	1.25	78.3							
48 hr	118	7.43	22.4	82.9	57	2.68	10.67				
Metal Specimen Data											
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter							
Al				Centrifuge							
Ti				Trace							
Ag											
Steel				Tube deposits: Below oil level							
Cu				At and above oil level							
Mg				Lt var							
Metal discoloration, deposits, pitting, or etching:											
Al				Sample temperature, °F							
Ti				Sample volume, ml							
Ag				Air rate, liter/hr							
Steel				Condensate return							
Cu				No							
Mg				385							
				200							
				130							
				No							

TABLE 48. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.70	0.24	--			
16 hr	12.3	5.15	0.74	37.0			
24 hr	22.3	5.58	0.79	54.0			
40 hr	64.6	7.19	1.19	84.0			
48 hr	119	9.12	2.06	94.0	57	2.41	10.94
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	None	
		Ti	-0.02		Centrifuge	Trace	
		Ag	+0.06				
		Steel	0.0	Tube deposits:	Below oil level	Lt var	
		Cu	-0.14		At and above oil level	Lt var	
		Mg	-0.04				
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
Al	Lt purple	Sample temperature, °F	385				
Ti	Dark purple	Sample volume, ml	200				
Ag	Tan	Air rate, liter/hr	130				
Steel	Blue-green	Condensate return	No				
Cu	Yellow-green						
Mg	Lt yellow-green						

TABLE 49. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data		100°F Vis		Vis,	Neut. No.,	Overhead	Oil Loss,	Overhead Sample	
Vis,	100°F Vis	Vis,	Neut. No.,	cs/210°F	mg KOH/g	Wt, g	wt %	Acidity,	Vis,
cs/100°F	Increase, %	cs/210°F	mg KOH/g					mg KOH/g	cs/100°F
Initial	--	4.70	0.24	--					
16 hr	12.5	5.15	0.86	36.6					
24 hr	23.0	5.57	0.34	53.5					
40 hr	62.8	7.19	1.18	83.1					
48 hr	129	9.59	1.78	93.0	58	2.02			11.01
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Al	-0.02	Sludge in oil:		200-mesh filter	None
				Ti	-0.02			Centrifuge	Trace
				Ag	+0.06				
				Steel	0.	Tube deposits:		Below oil level	Lt var
				Cu	-0.10			At and above oil level	Lt var
				Mg	+0.02				
Metal discoloration, deposits, pitting, or etching:				Test Conditions					
Al				Lt pink		Sample temperature, °F		385	
Ti				Purple		Sample volume, ml		200	
Ag				NC		Air rate, liter/hr		130	
Steel				Green		Condensate return		No	
Cu				Lt yellow					
Mg				Lt yellow					

TABLE 50. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		17.79	--	4.70	0.24	
16 hr		19.74	11.0	5.10	0.87	
24 hr		21.36	20.1	5.46	0.88	
40 hr		27.25	53.2	6.77	1.09	
48 hr		28.1	58.0	6.56	5.01	54
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	+0.02		Centrifuge	Trace
		Ag	0.0			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	-0.12		At and above oil	
		Mg	+0.04		level	Lt carbon
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	NC				
	Ti	Lt red-blue				
	Ag	Lt yellow				
	Steel	Blue				
	Cu	Yellow-brown				
	Mg	Lt yellow-green				
		Sample temperature, °F				385
		Sample volume, ml				200
		Air rate, liter/hr				130
		Condensate return				Yes

TABLE 51. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

<u>Sample Data</u>		<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		17.79	--	4.70	0.24	
16 hr		19.65	10.5	5.08	0.79	
24 hr		21.26	19.5	5.43	0.82	
40 hr		26.77	50.5	6.63	1.13	
48 hr		26.53	49.1	5.91	10.78	54
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	Trace
		Ag	0.0			
		Steel	+0.02	Tube deposits:	Below oil level	Lt var
		Cu	-0.20		At and above oil	
		Mg	+0.04		level	Lt var
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC			
		Ti	Blue-green		Sample temperature, °F	385
		Ag	Lt yellow		Sample volume, ml	200
		Steel	Peacock		Air rate, liter/hr	130
		Cu	Yellow-orange		Condensate return	Yes
		Mg	Lt yellow			

TABLE 52. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 390°F

Sample Data				Test Cell Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F				
Initial	--	4.70	0.24	--							
16 hr	12.8	5.10	0.89	40.5							
24 hr	23.0	5.51	0.91	59.1							
40 hr	144	7.89	27.9	100							
48 hr	--	(a)	36.2	108.5	66	7.12	10.52				
Metal Specimen Data				Test Cell Data							
Weight change, mg/cm ² :				Al	-0.02	Sludge in oil:		200-mesh filter	(a)		
				Ti	-0.02			Centrifuge	(a)		
				Ag	+0.04						
				Steel	+0.02	Tube deposits:		Below oil level		Lt var	
				Cu	-1.20			At and above oil level		Lt var	
				Mg	+0.04						
Metal discoloration, deposits, pitting, or etching:				Test Conditions							
				Al	Lt green	Sample temperature, °F				390	
				Ti	Lt blue	Sample volume, ml.				200	
				Ag	NC	Air rate, liter/hr				130	
				Steel	Lt brown	Condensate return				No	
				Cu	Severe pitting						
				Mg	Lt yellow						

(a) Sample gelled.

TABLE 53. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 390°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	17.79	--	4.70	0.24	--				
16 hr	20.07	12.8	5.17	0.79	40.7				
24 hr	22.03	23.8	5.55	0.91	59.7				
40 hr	54.68	207	9.50	27.7	101.5				
48 hr	(a)	--	(a)	30.9	108.0	69	9.85		10.64
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :					Sludge in oil:		200-mesh filter	(a)	
Al				+0.02			Centrifuge	(.)	
Ti				+0.04					
Ag				0.0					
Steel				+0.04			Tube deposits:	Below oil level	Lt var
Cu				-3.96				At and above oil level	Lt var
Mg				+0.02					
Test Conditions									
Metal discoloration, deposits, pitting, or etching:									
Al				NC					
Ti				Lt blue					Sample temperature, °F 390
Ag				Lt yellow					Sample volume, ml 200
Steel				Yellow-purple					Air rate, liter/hr 130
Cu				Severe etching					Condensate return No
Mg				Yellow					

(a) Sample gelled.

TABLE 54. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.79	--	4.70	0.24	--			
16 hr	19.98	12.3	4.80	1.00	47.4			
24 hr	23.55	32.4	5.10	20.5	74.9			
40 hr	(a)	--	(a)	37.9	110.8			
48 hr	--	--	--	--	--	69	1.94	11.27

Metal Specimen Data

<u>Test Cell Data</u>		<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Al	0.0	Sludge in oil: 200-mesh filter (a)
	Ti	+0.04	Centrifuge (a)
	Ag	-0.04	
	Steel	0.0	Tube deposits: Below oil level Med var
	Cu	-3.94	At and above oil level Med var
	Mg	-0.26	

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	Lt brown	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Green	Condensate return	No
Cu	Severe etching		
Mg	Slight pitting		

(a) Test terminated at 40 hr, sample gelled.

TABLE 55. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-7 AT 390°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.19	0.01	--			
16 hr	15.7	4.60	0.38	24.5			
24 hr	22.2	4.77	0.51	31.0			
40 hr	32.6	5.01	0.68	43.6			
48 hr	144	6.98	9.01	49.8	33	7.87	9.02
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	None	
		Ti	+0.02		Centrifuge	None	
		Ag	-0.08	Tube deposits:		None	
		Steel	-0.02		Below oil level	None	
		Cu	-0.20		At and above oil level	Lt carbon	
		Mg	-0.06				
<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>					
		Al	Lt yellow	Sample temperature, °F			390
		Ti	Brown	Sample volume, ml			200
		Ag	Lt yellow	Air rate, liter/hr			130
		Steel	Blue-green	Condensate return			No
		Cu	Slight pitting				
		Mg	Lt yellow				

TABLE 56. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.39	8.7	4.59	0.70	29.9			
24 hr	18.41	15.1	4.75	0.82	43.3			
40 hr	22.02	37.6	5.57	0.89	69.1			
48 hr	26.62	66.4	6.58	1.03	79.0	48	1.64	10.62

Metal Specimen Data

Weight change, mg/cm ² :	Al
	Ti
	Ag
	Steel
	Cu
	Mg

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt blue
Ag	NC
Steel	Blue
Cu	Yellow-brown
Mg	Lt yellow

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 57 RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.80	11.2	4.60	0.76	38.2			
24 hr	19.24	20.2	4.94	0.79	54.7			
40 hr	25.36	58.5	6.25	1.10	83.8			
48 hr	38.97	144	9.11	1.54	93.0	57	1.91	10.83

Metal Specimen Data

Weight change, mg/cm ² :		Test Cell Data	
Al	0.0	Sludge in oil:	200-mesh filter
Ti	+0.02		Centrifuge
Ag	-0.02		
Steel	0.0	Tube deposits:	Below oil level
Cu	-0.16		At and above oil level
Mg	+0.04		Lt var
			Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt blue
Ag	Tan
Steel	Blue
Cu	Gold
Mg	Lt yellow

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 58. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	18.03	12.9	4.64	0.82	42.8			
24 hr	19.71	20.0	5.02	0.91	62.6			
40 hr	27.70	73.4	6.68	1.86	96.1			
48 hr	68.25	327	14.41	3.17	105.2	63	2.30	11.00

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	(a)
	Ag	+0.02			
	Steel	-0.08	Tube deposits:	Below oil level	None
	Cu	-0.16		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	390
Ti	Lt blue	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Yellow		
Mg	Lt yellow		

(a) Insufficient sample.

TABLE 59. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.95	12.2	4.63	1.02	49.4			
24 hr	21.55	34.7	4.80	17.86	76.9			
40 hr	(a)	--	(a)	25.2	109.9			
48 hr	--	--	--	--	--	68	14.56	10.55

Metal Specimen Data

<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Sludge in oil: 200-mesh filter (a)
Al	Centrifuge (a)
Ti	
Ag	
Steel	Tube deposits: Below oil level Hvy var
Cu	At and above oil level Med var
Mg	

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	Lt blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Lt yellow	Condensate return	No
Cu	Severe etching		
Mg	Slight pitting		

(a) Test terminated at 40 hr, sample gelled.

TABLE 60. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 375°F

Sample Data				Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KCH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	--	4.45	0.22						
16 hr	8.3	4.74	0.71	28.0					
24 hr	14.4	4.98	0.80	40.6					
40 hr	35.2	5.76	0.86	65.4					
48 hr	57.2	6.59	0.99	75.6	44	1.69	10.33		
Metal Specimen Data									
Weight change, mg/cm ² :				Sludge in oil:		200-mesh filter		None	
Al						Centrifuge		Trace	
Ti									
Ag									
Steel									
Cu						Tube deposits: Below oil level		Lt var	
M _s						At and above oil level		Lt var	
M ₅									
Metal discoloration, deposits, pitting, or etching:				Test Conditions					
Al				Sample temperature, °F					
Ti				Sample volume, ml					
Ag				Air rate, liter/hr					
Steel				Condensate return					
Cu				No					
Mg									

TABLE 61. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 385°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt g	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.45	0.22	--			
16 hr	11.8	4.85	0.76	38.0			
24 hr	20.6	5.18	0.82	53.9			
40 hr	25.69	6.31	1.10	82.8			
48 hr	28.58	6.11	13.96	94.3	57	1.37	10.80
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
				Centrifuge			
				Tube deposits: Below oil level			
				At and above oil level			
				None			
				Trace			
				Lt var			
				Lt var			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg							

TABLE 62. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		16.84	--	4.45	0.22	
16 hr		18.54	10.1	4.78	0.80	
24 hr		19.83	17.8	5.07	0.81	
40 hr		23.89	41.9	6.01	1.20	
48 hr		35.35	110	6.94	21.9	57
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	Trace
		Ag	-0.10			
		Steel	+0.02	Tube deposits:	Below oil level	Lt var
		Cu	-0.59		At and above oil level	Lt var
		Mg	+0.04			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	Lt blue	Sample temperature, °F	385		
	Ti	Blue-green	Sample volume, ml	200		
	Ag	NC	Air rate, liter/hr	130		
	Steel	Blue-green	Condensate return	Yes		
	Cu	Moderate pitting				
	Mg	Lt yellow				

TABLE 63. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 390°F

Sample Data						Overhead Sample	
Vis, ca/100°F	100°F Vis Increase, %	Vis, c°/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.45	0.22	--			
16 hr	11.8	4.86	0.80	38.5			
24 hr	21.3	5.24	0.93	55.9			
40 hr	173	8.32	29.6	95.1			
48 hr	(a)	(a)	34.3	100.2	66	5.95	10.63
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	(a)	
		Ti	+0.02		Centrifuge	(a)	
		Ag	+0.02				
		Steel	+0.02	Tube deposits:	Below oil level	Lt var	
		Cu	+0.99		At and above oil level	Lt var	
		Mg	+0.06				
Metal discoloration, deposits, pitting, or etchings:		Test Conditions					
		Al	NC	Sample temperature, F°	390		
		Ti	Blue-yellow	Sample volume, ml	200		
		Ag	yellow	Air rate, liter/hr	130		
		Steel	Yellow-red	Condensate return	No		
		Cu	Severe etching				
		Mg	Yellow				

(a) Sample gelled.

TABLE 64. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 390°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	16.84	--	4.45	0.22	--				
16 hr	18.81	11.7	4.83	0.93	39.8				
24 hr	20.38	21.0	5.19	0.90	58.3				
40 hr	39.87	137	7.39	28.3	98.5				
48 hr	(a)	--	(a)	(a)	108.7	66	9.14		10.64
Metal Specimen Data					Test Cell Data				
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter				
Al					(a)				
Ti					(a)				
Ag					Centrifuge				
Steel					Tube deposits: Below oil level				
Cu					At and above oil level				
Mg					Lt var				
					Lt var				
Metal discoloration, deposits, pitting, or etching:									
Al					NC				
Ti					Sample temperature, °F				
Ag					Sample volume, ml				
Steel					Air rate, liter/hr				
Cu					Condensate return				
Mg					No				

(a) Insufficient sample.

TABLE 65. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.45	0.22	--			
16 hr	18.71	11.1	4.82	1.02	46.8			
24 hr	25.05	48.8	5.25	23.2	76.2			
40 hr	(a)	--	(a)	40.1	111.4			
48 hr	--	--	--	--	--	69	19.87	10.54

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.14	Sludge in oil: 200-mesh filter Centrifuge	(a)
	Ti	0.0		
	Ag	+0.04		
	Steel	+0.06		
	Cu	-4.3		
	Mg	-0.34		

Test Cell Data

Tube deposits: Below oil level Hvy var
At and above oil level Med var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt blue
Ag	NC
Steel	Lt blue
Cu	Severe etching
Mg	Moderate pitting

Test Conditions

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Test terminated at 40 hr, sample gelled.

TABLE 66. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-1 AT 390°F

Sample Data									
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt%	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	17.48	--	4.64	0.23	--				
16 hr	19.74	12.9	5.15	0.63	39.7				
24 hr	21.78	24.6	5.57	0.74	58.3				
40 hr	28.37	62.3	6.90	2.00	90.4				
48 hr	92.29	428	14.64	18.93	102.1	63	2.71		10.68
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :									
Al									
Ti									
Ag									
Steel									
Cu									
Mg									
Sludge in oil: 200-mesh filter									
Centrifuge									
Tube deposits: Below oil level									
At and above oil level									
Lt var									
None									
Test Conditions									
Sample temperature, °F									
390									
Sample volume, ml									
200									
Air rate, liter/hr									
130									
Condensate return									
No									

(a) Insufficient sample.

TABLE 67. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-2 AT 390°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.31	0.22	--			
16 hr	11.5	4.70	0.62	38.2			
24 hr	21.5	5.05	0.72	56.0			
40 hr	58.1	6.32	1.26	86.8			
48 hr	94.5	6.84	11.58	97.8	61	2.19	10.92
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	None	
		Ti	+0.02		Centrifuge	(a)	
		Ag	0.0				
		Steel	0.0	Tube deposits:	Below oil level	None	
		Cu	+0.14		At and above oil level	Lt var	
		Mg	+0.16				
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
		Al	Lt yellow	Sample temperature, °F		390	
		Ti	Brown	Sample volume, ml		200	
		Ag	Lt yellow	Air rate, liter/hr		130	
		Steel	Reddish-blue	Condensate return		No	
		Cu	Blue-brown				
		Mg	Dark grey				

(a) Insufficient sample.

TABLE 68. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-3 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.24	--	4.09	0.24	--			
16 hr	16.95	11.2	4.38	0.76	40.8			
24 hr	18.26	19.8	4.66	0.76	59.0			
40 hr	148.0	871	18.04	25.3	101.3			
48 hr	(a)	--	(a)	23.7	102.3	65	11.37	10.39

Metal Specimen Data

<u>Weight change, mg/cm²:</u>		<u>Test Cell Data</u>	
Al	+0.04	Sludge in oil:	200-mesh filter (a)
Ti	+0.06		Centrifuge (a)
Ag	-0.04		
Steel	+0.08	Tube deposits:	Below oil level Med var
Cu	-0.99		At and above oil level Med var
Mg	-12.60		

Metal discoloration, deposits,
pitting, or etching:

Al	NC	<u>Test Conditions</u>	
Ti	Blue	Sample temperature, °F	390
Ag	Lt yellow	Sample volume, ml	200
Steel	Blue-green	Air rate, liter/hr	130
Cu	Severe etching	Condensate return	No
Mg	Severe etching		

(a) Sample gelled.

TABLE 69. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-7 AT 390°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.37	0.10	--			
16 hr	11.3	3.65	0.79	47.6			
24 hr	18.7	3.87	0.68	68.8			
40 hr	67.1	5.16	1.39	104.0			
48 hr	--	(a)	(a)	111.4	67	1.45	10.67
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:		200-mesh filter	(a)
		Ti	0.0			Centrifuge	(a)
		Ag	-0.06	Tube deposits: Below oil level At and above oil level			
		Steel	0.0				
		Cu	-0.04				
		Mg	+0.04				
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>					
		Al	Lt yellow	Sample temperature, °F		390	
		Ti	Brown-red	Sample volume, ml		200	
		Ag	Brown-red	Air rate, liter/hr		130	
		Steel	Blue-green	Condensate return		No	
		Cu	Brown				
		Mg	Brown-red				

(a) Insufficient sample.

TABLE 70. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.77	--	3.50	0.15	--			
16 hr	14.54	5.6	3.62	0.34	14.5			
24 hr	14.80	7.5	3.69	0.43	20.9			
40 hr	15.36	11.5	3.77	0.54	34.1			
48 hr	17.76	29.0	3.87	0.55	40.0	27	1.62	11.24

Metal Specimen Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	Trace
	Ag			
	Steel	Tube deposits:	Below oil level	None
	Cu		At and above oil level	Lt var
	Mg			

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt brown
Ag	Lt yellow
Steel	Blue
Cu	Red-brown
Mg	Grey

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 71. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 385°F

Sample Data		Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Aleut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.50	0.15	--			
16 hr	7.4	3.65	0.43	21.2			
24 hr	9.9	3.72	0.51	30.4			
40 hr	16.1	3.86	0.59	47.0			
48 hr	19.8	4.01	0.50	54.0	35	1.71	11.42
Metal Specimen Data							
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter	None
		Ti	+0.04			Centrifuge	0.05 ml/25
		Ag	-0.04				
		Steel	-0.04	Tube deposits:		Below oil level	None
		Cu	-0.62			At and above oil	
		Mg	-0.12			level	Lt var
Metal discoloration, deposits, pitting, or etching:		Al	NC				
		Ti	Tan	Sample temperature, °F		385	
		Ag	Lt yellow	Sample volume, ml		200	
		Steel	Blue	Air rate, liter/hr		130	
		Cu	Severe pitting	Condensate return		No	
		Mg	Grey				

TABLE 72. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.77	--	3.50	0.15	--			
16 hr	14.80	7.5	3.67	0.45	23.3			
24 hr	15.13	9.9	3.78	0.55	34.0			
40 hr	16.16	17.4	3.92	0.61	53.6			
48 hr	17.09	24.1	4.09	0.63	66.2	39	1.88	11.38

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge	0.25 ml/25
	Ag	+0.02			
	Steel	-0.12	Tube deposits:	Below oil level	None
	Cu	-0.43		At and above oil level	Lt var
	Mg	-0.26			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F	390
Ti	Brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	No
Cu	Mod etching		
Mg	Brown		

TABLE 73. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.50	0.15	--			
16 hr	7.9	3.69	0.52	29.6			
24 hr	11.8	3.78	0.62	43.1			
40 hr	23.8	4.07	0.73	67.2			
48 hr	37.0	4.41	0.88	76.4	47	2.03	11.44
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.16	Sludge in oil:		200-mesh filter	None
		Ti	+0.08			Centrifuge	Trace
		Ag	+0.02				
		Steel	+0.08	Tube deposits:		Below oil level	None
		Cu	-0.49			At and above oil level	At var
		Mg	-0.08				
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
		Al	NC	Sample temperature, °F		400	
		Ti	Brown	Sample volume, ml		200	
		Ag	NC	Air rate, liter/hr		130	
		Steel	Lt blue	Condensate return		No	
		Cu	Slight pitting				
		Mg	Brown				

TABLE 74. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-63-8 AT 400°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.50	0.15	--			
16 hr	8.4	3.70	0.58	30.8			
24 hr	11.8	3.83	0.67	44.1			
40 hr	24.6	4.08	0.84	68.7			
48 hr	38.1	4.42	0.94	78.4	48	2.03	11.45
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:		200-mesh filter	None
		Ti	+0.08			Centrifuge	Trace
		Ag	0.0				
		Steel	+0.06	Tube deposits:		Below oil level	None
		Cu	-0.32			At and above oil level	Lt var
		Mg	-0.08				
Metal discoloration, deposits, pitting, or etching:		Al	Lt yellow	<u>Test Conditions</u>			
		Ti	Purple	Sample temperature, °F		400	
		Ag	NC	Sample volume, ml		200	
		Steel	Lt blue	Air rate, liter/hr		130	
		Cu	Slight pitting	Condensate return		No	
		Mg	Lt green				

TABLE 75. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-12 AT 390 °F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, Vis, mg KOH/g cs/100°F		
Initial	15.51	--	3.91	0.23	--				
16 hr	16.90	9.0	4.16	0.47	29.7				
24 hr	17.64	13.7	4.32	0.63	43.8				
40 hr	20.65	33.1	4.93	0.68	70.8				
48 hr	25.06	61.6	5.79	0.91	82.0	48	1.63		11.64
Metal Specimen Data					Test Cell Data				
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter				
Al					Centrifuge				
Ti					(a)				
Ag					None				
Steel					Lt var				
Cu					At and above oil level				
Mg					None				
Metal discoloration, deposits, pitting, or etching:									
Test Conditions									
Al Lt blue Sample temperature, °F 390									
Ti Blue Sample volume, ml 200									
Ag NC Air rate, liter/hr 130									
Steel Peacock Condensate return No									
Cu Mod pitting									
Mg Orange									

(a) Insufficient sample.

TABLE 76. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt%	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.88	--	4.39	0.05	--			
16 hr	18.37	8.8	4.72	1.02	25.6			
24 hr	18.78	11.3	4.81	1.17	36.9			
40 hr	19.97	18.3	5.07	1.49	57.8			
48 hr	21.29	26.1	5.37	1.65	67.2	41	3.08	12.12

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.06
	Ti	0.0
	Ag	0.0
	Steel	+0.04
	Cu	-0.08
	Mg	-0.08

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Lt var
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Yellow-blue
Ag	Lt yellow
Steel	Brown-yellow
Cu	Brown
Mg	Lt yellow

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 77. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 385°F

<u>Sample Data</u>					<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.34	0.29	--			
16 hr	15.4	4.92	0.65	37.7			
24 hr	29.3	5.36	0.65	54.3			
40 hr	82.7	7.26	0.93	81.6			
48 hr	170	10.24	1.14	89.1	56	1.75	9.90
<u>Metal Specimen Data</u>					<u>Test Cell Data</u>		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al						Centrifuge	Trace
Ti							
Ag							
Steel					Tube deposits:	Below oil level	Lt var
Cu						At and above oil level	Lt var
Mg							
Metal discoloration, deposits, pitting, or etching:					<u>Test Conditions</u>		
Al					Sample temperature, °F		385
Ti					Sample volume, ml		200
Ag					Air rate, liter/hr		130
Steel					Condensate return		No
Cu							
Mg							

TABLE 78. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	16.47	--	4.34	0.29	
16 hr	18.65	13.2	4.80	0.62	
24 hr	20.73	25.9	5.24	0.67	
40 hr	28.84	75.1	6.98	0.84	
48 hr	41.65	153	9.67	1.17	55

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	Trace
	Ag	-0.02			
	Steel	0.0	Tube deposits:	Below oil level	Lt var
	Cu	-0.04		At and above oil level	Lt var
	Mg	+0.02			

Test Conditions

Meta discoloration, deposits,

pitting, or etching:

Al	NC	Sample temperature, °F	385
Ti	Blue-red	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	Yes
Cu	Lt brown		
Mg	NC		

TABLE 79. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt, g	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.47	--	4.34	0.29	--		
16 hr	19.15	16.3	4.99	0.70	40.9		
24 hr	21.83	32.5	5.55	0.93	60.3		
40 hr	32.81	99.2	7.60	1.67	90.7		
48 hr	69.18	320	13.50	6.73	98.4	2.58	9.83

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	(a)
	Ag	+0.06			
	Steel	-0.10	Tube deposits:	Below oil level	Lt var
	Cu	0.0		At and above oil level	Lt var
	Mg	-0.02			

Metal discoloration, deposits,

pitting, or etching:	Al	NC	Sample temperature, °F	390
	Ti	Yellow-blue	Sample volume, ml	200
	Ag	Lt pink	Air rate, liter/hr	130
	Steel	Pink-yellow	Condensate return	No
	Cu	Lt brown		
	Mg	Lt brown		

Test Conditions

(a) Insufficient sample.

TABLE 80. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss Wt, g	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.47	--	4.34	0.29	--		
16 hr	19.45	18.1	4.94	0.89	47.9		
24 hr	21.61	31.2	5.31	1.48	70.4		
40 hr	(a)	--	(a)	30.3	111.1		
48 hr	--	--	--	--	--	11.63	9.78

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.30 (b)		Centrifuge	(a)
	Ag	+0.02	Tube deposits:	Below oil level	Lt var
	Steel	+0.06		At and above oil level	Lt var
	Cu	+0.04			
	Mg	-0.45			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Yellow
Ag	Yellow
Steel	Red-green
Cu	Brown
Mg	Lt carbon

Test Conditions

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Test terminated at 40 hr, sample gelled.

(b) Weight error suspected.

TABLE 81. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--			
16 hr	29.29	6.5	5.26	0.09	3.4			
24 hr	30.04	9.2	5.38	0.19	4.6			
40 hr	31.01	12.8	5.50	0.30	7.0			
43 hr	31.37	14.8	5.52	0.31	7.9	10	2.54	(a)

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.06		Centrifuge	None
	Ag	-0.04	Tube deposits:	Below oil level	None
	Steel	+0.02		At and above oil level	None
	Cu	0.0			
	Mg	0.0			

Test Cell Data

Test Conditions

Metal discoloration, deposits, pitting, or etching:	Al	NC	Sample temperature, °F	375
	Ti	NC	Sample volume, ml	200
	Ag	Lt yellow	Air rate, liter/hr	130
	Steel	Blue	Condensate return	No
	Cu	Rose		
	Mg	NC		

(a) Insufficient sample.

TABLE 82. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-64-2 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--	--	--	--
16 hr	29.54	7.4	5.35	0.19	4.5			
24 hr	30.64	11.4	5.45	0.25	6.1			
40 hr	31.48	14.5	5.61	0.33	8.9			
48 hr	32.65	18.7	5.72	0.38	10.1	15	3.33	21.54

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.06
	Ti	0.0
	Ag	+0.06
	Steel	+0.04
	Cu	-0.10
	Mg	+0.02

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	Lt yellow
Steel	Blue
Cu	Purple
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 83. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 385°F

<u>Sample Data</u>						
	<u>Vis</u> cs/100°F	<u>100°F Vis</u> Increase, %	<u>Vis,</u> cs/210°F	<u>Neut. No.,</u> mg KOH/g	<u>Oil Loss,</u> wt %	
Initial	27.50	--	5.08	0.07		
16 hr	29.92	8.8	5.36	0.21		
24 hr	30.72	11.7	5.45	0.24		
40 hr	31.85	15.8	5.68	0.30		
48 hr	32.59	18.5	5.70	0.31	16	
<u>Metal Specimen Data</u>						
Weight change, mg/cm ² :		Al	-0.04	Sludge in oil:	200-mesh filter:	None
		Ti	0.0		Centrifuge	None
		Ag	+0.02	Tube deposits: Below oil level None At and above oil level None		
		Steel	-0.04			
		Cu	-0.06			
		Mg	0.0			
<u>Metal discoloration, deposits,</u> <u>pitting, or etching:</u>						
	Al	NC	<u>Test Conditions</u> Sample temperature, °F 385 Sample volume, ml 200 Air rate, liter/hr 130 Condensate return Yes			
	Ti	Lt tan				
	Ag	Lt yellow				
	Steel	Blue				
	Cu	Purple				
	Mg	NC				

TABLE 84. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 390°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.08	0.07	--			
16 hr	10.0	5.39	0.33	6.0			
24 hr	13.2	5.49	0.27	8.6			
40 hr	18.5	5.69	0.36	12.9			
48 hr	21.8	5.81	0.36	14.5	17	2.69	21.34
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.06	Sludge in oil:		200-mesh filter	None
		Ti	+0.04			Centrifuge	None
		Ag	-0.04				
		Steel	-0.02	Tube deposits:		Below oil level	None
		Cu	-0.08			At and above oil level	None
		Mg	-0.06				
Metal discoloration, deposits, pitting, or etching:		Al	NC				
		Ti	Grey	Sample temperature, °F			390
		Ag	Yellow	Sample volume, ml			200
		Steel	Blue	Air rate, liter/hr			130
		Cu	Rose	Condensate return			No
		Mg	NC				

TABLE 85. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, wt %	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--		
16 hr	30.89	12.3	5.48	0.30	10.4		
24 hr	31.96	16.2	5.58	0.40	14.7		
40 hr	35.81	22.9	5.81	0.43	21.4		
48 hr	35.15	27.8	6.01	0.47	23.9	3.93	21.32

Metal Specimen Data

Test Cell Data

Weight charge, mg/cm ² :	Al	+0.14	Sludge in oil: 200-mesh filter Centrifuge	None
	Ti	-0.06		None
	Ag	0.0		
	Steel	+0.30	Tube deposits: Below oil level At and above oil level	None
	Cu	-1.54		None
	Mg	0.0		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	NC		200
Ag	NC		130
Steel	Lt blue		No
Cu	Mod pitting		
Mg	Rose	Sample volume, ml	
		Air rate, liter/hr	
		Condensate return	

TABLE 86. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
CN C-64-12 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	15.44	12.0	3.77	0.61	10.9			
24 hr	15.53	13.0	3.88	0.75	15.8			
40 hr	15.83	14.8	3.91	0.89	25.3			
48 hr	15.54	12.7	3.85	0.96	29.4	23	2.48	11.61

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.12	Sludge in oil: 200-mesh filter Centrifuge	None 0.20 ml/25
	Ti	+0.08		
	Ag	+0.12		
	Steel	+0.16		
	Cu	-0.10		
	Mg	+0.20		

Metal discoloration, deposits,
pitting, or etching:

Al	Lt brown
Ti	Dk brown
Ag	Lt brown
Steel	Brown
Cu	Brown
Mg	Brown

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 87. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Naut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Sample Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	14.71	6.7	3.70	0.88	16.0			
24 hr	15.39	11.6	3.98	0.86	22.9			
40 hr	15.95	15.7	4.04	1.11	35.5			
48 hr	15.78	14.4	3.86	1.27	41.0	31	2.85	11.95

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.40 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt carbon
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon	
Ti	Lt carbon	Sample temperature, °F
Ag	Lt carbon	Sample volume, ml
Steel	Lt carbon	Air rate, liter/hr
Cu	Mottled carbon	Condensate return
Mg	Lt carbon	No

TABLE 88. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	15.55	12.8	3.90	0.90	20.6			
24 hr	15.81	14.6	3.85	1.04	30.0			
40 hr	15.78	14.4	3.89	0.93	47.5			
48 hr	15.96	15.7	3.91	1.36	55.6	34	3.16	12.14

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.75 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt carbon
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon	Sample temperature, °F	390
Ti	Lt carbon	Sample volume, m ³	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Lt carbon	Condensate return	No
Cu	Sight pitting		
Mg	Lt carbon		

TABLE 89. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt%	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.52	0.25	--			
16 hr	12.8	3.81	1.17	25.1			
24 hr	15.4	3.90	1.44	35.9			
40 hr	20.7	4.01	1.86	55.6			
48 hr	23.4	4.11	2.24	64.3	43	3.86	12.22
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Sludge in oil: 200-mesh filter Centrifuge					
		None					
		0.25 ml/25					
Metal discoloration, deposits, pitting, or etching:		Tube deposits: Below oil level At and above oil level					
		Lt carbon					
		Lt carbon					
		Lt carbon					
		Steel					
		Cu					
		Mg					
		+0.51					
		+0.51					
		+0.37					
		+0.24					
		+0.12					
		+0.40					
Test Conditions							
Sample temperature, °F		400					
Sample volume, ml		200					
Air rate, liter/hr		130					
Condensate return		No					

TABLE 90. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 375°F

<u>Sample Data</u>					<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.32	0.28	--			
16 hr	6.9	5.60	0.06	3.7			
24 hr	9.2	5.68	0.05	5.1			
40 hr	14.6	5.88	0.06	7.9	14	1.35	(a)
48 hr	17.4	6.00	0.07	8.9			
<u>Metal Specimen Data</u>					<u>Test Cell Data</u>		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al					Centrifuge		
Ti							
Ag					Tube deposits: Below oil level		
Steel					At and above oil level		
Cu					None		
Mg					None		
Metal discoloration, deposits, pitting, or etching:					<u>Test Conditions</u>		
Al					Sample temperature, °F		
Ti					Sample volume, ml		
Ag					Air rate, liter/hr		
Steel					Condensate return		
Cu							
Mg							

(a) Insufficient sample.

TABLE 91. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	--	5.32	0.28	--			
16 hr	30.83	8.4	5.64	0.03	5.8			
24 hr	31.76	11.7	5.76	0.05	8.1			
40 hr	33.71	18.6	6.05	0.06	11.5			
48 hr	35.32	24.2	6.24	0.10	12.7	19	1.57	17.74

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	0.05 ml/25
	Ag	+0.04			
	Steel	-0.02	Tube deposits:	Below oil level	None
	Cu	-0.65		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	White
Steel	Lt brown
Cu	Slight pitting
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 92. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 385°F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	28.43	--	5.32	0.28	
16 hr	30.77	8.2	5.65	0.02	
24 hr	31.56	11.0	5.76	0.03	
40 hr	33.53	17.9	6.03	0.04	
48 hr	34.85	22.6	6.19	0.04	18

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter None
	Ti		Centrifuge 0.05 ml/25
	Ag		
	Steel	Tube deposits:	Below oil level None
	Cu		At and above oil level None
Metal discoloration, deposits, pitting, or etching:	Mg		
	Al	<u>Test Conditions</u>	
	Ti	Sample temperature, °F	
	Ag	Sample volume, ml	
	Steel	Air rate, liter/hr	
	Cu	Condensate return	
	Mg		

TABLE 93. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	--	5.32	0.28	--			
16 hr	30.88	8.6	5.64	0.04	9.7			
24 hr	31.86	12.1	5.81	0.10	13.9			
40 hr	34.21	20.3	6.11	0.63	20.8			
48 hr	35.87	26.2	6.32	0.09	23.4	21	1.74	17.55

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	0.05 ml/25
	Ag	0.0			
	Steel	-0.10	Tube deposits:	Below oil level	None
	Cu	-0.67		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC			
Ti	Lt yellow	Sample temperature, °F	390	
Ag	NC	Sample volume, ml	200	
Steel	Lt brown	Air rate, liter/hr	130	
Cu	Severe etching	Condensate return	No	
Mg	NC			

TABLE 94. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	-	5.32	0.28	--			
16 hr	31.67	11.4	5.76	0.06	13.0			
24 hr	33.21	16.8	5.96	0.09	18.3			
40 hr	37.00	30.1	6.44	0.21	26.0			
48 hr	80.52	183	10.48	5.73	34.4	30	27.22	14.88

Metal Specimen Data

Weight change, mg/cm ² :	Test Cell Data		
	Sludge in oil:	200-mesh filter Centrifuge	None 0.10 ml/25
Al	+0.14		
Ti	-0.18		
Ag	0.0		
Steel	+0.02	Tube deposits: Below oil level	None
Cu	-1.28	At and above oil level	None
Mg	-0.02		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	NC	Sample volume, ml	200
Ag	White	Air rate, liter/hr	130
Steel	Purple	Condensate return	No
Cu	Severe etching		
Mg	NC		

TABLE 95. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.06	--	3.34	0.17	--			
16 hr	13.56	3.8	3.43	1.02	15.8			
24 hr	13.43	2.8	3.42	1.21	23.1			
40 hr	13.77	5.4	3.44	1.48	37.6			
48 hr	13.67	4.7	3.45	1.57	44.8	28	4.08	12.58

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.14
	Ti	+0.14
	Ag	+0.16
	Steel	+0.12
	Cu	+0.18
	Mg	+0.18

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:		
	Below oil level	Med var
	At and above oil level	Med var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt carbon
Ti	Lt carbon
Ag	Lt carbon
Steel	Lt carbon
Cu	Lt carbon
Mg	Lt carbon

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 96. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 390°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.34	0.17	--			
16 hr	4.4	3.44	1.14	18.0			
24 hr	4.1	3.43	1.35	27.0			
40 hr	5.4	3.46	1.97	44.5			
48 hr	30.9	3.96	13.97	55.6	36	5.72	12.26
<u>Metal Specimen Data</u>				<u>Test Cell Data</u>			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag							
Steel				Tube deposits: Below oil level			
Cu				At and above oil level			
Mg				Med var			
				Med var			
<u>Metal discoloration, deposits, pitting, or etching:</u>				<u>Test Conditions</u>			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu							
Mg							

TABLE 97. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 390°F

Sample Data												Overhead Sample	
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F					
Initial	13.06	--	3.34	0.17	--								
16 hr	13.54	3.7	3.43	1.09	17.9								
24 hr	13.64	4.4	3.42	1.16	26.9								
40 hr	13.80	5.7	3.47	1.80	45.1								
48 hr	16.39	25.5	3.86	11.40	55.3	37	5.03	12.30					
Metal Specimen Data				Test Cell Data									
Weight change, mg/cm ² :				Al	+0.28	Sludge in oil:		200-mesh filter	None				
				Ti	+0.32			Centrifuge	Trace				
				Ag	+0.24								
				Steel	+0.22	Tube deposits:		Below oil level	Lt var				
				Cu	+0.16			At and above oil level	Lt var				
				Mg	+0.20								
Metal discoloration, deposits, pitting, or etching:				Test Conditions									
				Al	Lt carbon	Sample temperature, °F		390					
				Ti	Lt carbon	Sample volume, ml		200					
				Ag	Lt carbon	Air rate, liter/hr		130					
				Steel	Lt carbon	Condensate return		No					
				Cu	Mottled carbon								
				Mg	Lt carbon								

TABLE 98. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 400°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.34	0.17	--			
16 hr	4.2	3.42	1.41	24.4			
24 hr	4.4	3.43	1.78	36.0			
40 hr	1365	6.85	43.6	76.8			
48 hr (a)	--	(a)	49.6	84.7	55	24.7	11.33
<u>Metal Specimen Data</u>							
<u>Weight change, mg/cm²:</u>				<u>Test Cell Data</u>			
Al				Sludge in oil: 200-mesh filter (a)			
Ti				Centrifuge (a)			
Ag							
Steel				Tube deposits: Below oil level Lt var			
Cu				At and above oil level Lt var			
Mg							
<u>Metal discoloration, deposits, pitting, or etching:</u>				<u>Test Conditions</u>			
Al				Sample temperature, °F 400			
Ti				Sample volume, ml 200			
Ag				Air rate, liter/hr 130			
Steel				Condensate return No			
Cu							
Mg							

(a) Sample gelled.

TABLE 99. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.20	0.11	--			
16 hr	18.00	6.9	4.51	0.66	13.6			
24 hr	18.46	9.6	4.61	0.70	19.7			
40 hr	19.52	15.9	4.84	0.93	30.4			
48 hr	20.27	20.4	5.00	1.10	34.7	28	2.56	11.02

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.04
	Ag	-0.02
	Steel	+0.04
	Cu	-0.06
	Mg	-0.02

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt carbon

Metal discoloration, deposits,
pitting, or etching:

Al	Grey
Ti	Lt yellow
Ag	Lt yellow
Steel	Brown
Cu	Lt green
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 100. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.29	0.11	--			
16 hr	18.31	8.7	4.56	0.86	22.8			
24 hr	18.80	11.6	4.69	0.96	31.7			
40 hr	20.20	20.0	4.96	1.45	47.9			
48 hr	21.42	27.2	5.22	1.69	55.0	36	3.11	11.21

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	0.0	Sludge in oil: 200-mesh filter
	Ti	0.0	Centrifuge
	Ag	0.0	
	Steel	0.0	Tube deposits: Below oil level
	Cu	-0.10	At and above oil level
	Mg	-0.02	Lt var
			Lt var

Metal discoloration, deposits,
pitting, or etching:

<u>Test Conditions</u>			
Al	Grey	Sample temperature, °F	385
Ti	Blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Lt brown		
Mg	Grey		

TABLE 101. RESULTS OF NONREFLUX OXILATION-CORROSION TEST
ON O-64-18 AT 390°F

Sample Data

	Vis. cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.29	0.11	--			
16 hr	18.33	8.8	4.58	0.98	25.7			
24 hr	18.87	12.1	4.68	1.19	36.9			
40 hr	20.36	20.9	5.01	1.91	37.3			
48 hr	22.08	31.1	4.97	3.19	47.4	43	2.47	10.75

Metal Specimen Data

Test Cell Data

Weight change, rag/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	Trace
	Ag	+0.02			
	Steel	-0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.26		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Grey		Sample temperature, °F	390
Ti	Blue		Sample volume, ml	200
Ag	Lt yellow		Air rate, liter/hr	130
Steel	Yellow-green		Condensate return	No
Cu	Slight etching			
Mg	Green			

TABLE 102. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.29	0.11	--			
16 hr	10.3	4.62	1.32	33.8			
24 hr	14.0	4.73	1.84	47.6			
40 hr	1140	9.32	24.8	84.9			
48 hr	--	(a)	(a)	93.0	58	15.25	10.93
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:		200-mesh filter	(a)
		Ti	-0.22(b)			Centrifuge	(a)
		Ag	-0.02				
		Steel	+0.02	Tube deposits:		Below oil level	Lt var
		Cu	-1.40			At and above oil level	Lt var
		Mg	+0.02				
Metal discoloration, deposits, pitting, or etching:		Lt yellow		Test Conditions			
Al		Lt yellow		Sample temperature, °F		400	
Ti		Lt yellow		Sample volume, ml		200	
Ag		Lt yellow		Air rate, liter/hr		130	
Steel		Brown		Condensate return		No	
Cu		Severe etching					
Mg		Lt green					

(a) Insufficient sample.

(b) Weight error suspected.

TABLE 103. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-21 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.56	--	3.55	0.07	--			
16 hr	15.97	2.6	3.62	0.10	13.3			
24 hr	16.11	3.5	3.63	0.12	19.5			
40 hr	16.46	5.8	3.69	0.22	31.5			
48 hr	16.74	7.6	3.72	0.26	37.3	26	1.64	15.36

Metal Specimen Data

<u>Weight change, mg/cm²:</u>		<u>Test Cell Data</u>	
Al	-0.02	Sludge in oil:	200-mesh filter
Ti	0.0		Centrifuge
Ag	0.0		
Steel	-0.02	Tube deposits:	Below oil level
Cu	-0.26		At and above oil level
Mg	0.0		None
			Trace

Metal discoloration, deposits,
pitting, or etching:

<u>Test Conditions</u>	
Al	NC
Ti	Lt brown
Ag	Lt yellow
Steel	Blue
Cu	Slight pitting
Mg	NC
Sample temperature, °F	
390	
Sample volume, ml	
200	
Air rate, liter/hr	
130	
Condensate return	
No	

TABLE 104. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead		Overhead Sample	
					Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.00	3.9	4.21	0.20	8.1			
24 hr	19.26	5.4	4.25	0.28	13.1			
40 hr	19.70	7.8	4.34	0.40	22.7			
48 hr	20.17	10.3	4.39	0.41	27.4	23	2.41	14.97

Metal Specimen Data

Normal Electro-
Clean-up cleaned

Test Cell Data

Weight change, mg/cm ² : Al	0.0	-0.02	Sludge in oil: 200-mesh filter	None
Ti	-0.02	-0.02	Centrifuge	None
Ag	-0.06	-0.04		
Steel	-0.02	-0.02	Tube deposits: Below oil level	None
Cu	-0.06	-0.10	At and above oil level	None
Mg	-0.08	-0.10		

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Purple
Cu	Red-yellow
Mg	Grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 105. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	18.28	--	4.09	0.17	
16 hr	19.00	3.9	4.23	0.20	
24 hr	19.27	5.4	4.26	0.27	
40 hr	19.70	7.8	4.32	0.38	
48 hr	20.11	10.0	4.39	0.46	24

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.04		Centrifuge	None
	Ag	-0.06			
	Steel	0.0	Tube deposits:	Below oil level	None
	Cu	-0.06		At and above oil level	None
	Mg	-0.14			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Purple	Condensate return	Yes
Cu	Yellow-orange		
Mg	Grey		

TABLE 106. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample:	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.04	4.2	4.22	0.22	9.7			
24 hr	19.38	6.0	4.26	0.31	15.7			
40 hr	19.95	9.1	4.36	0.43	27.6			
48 hr	20.50	12.1	4.44	0.48	33.2	26	2.16	15.03

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	None
	Ag	-0.04	Tube deposits: Below oil level At and above oil level		
	Steel	+0.04			
	Cu	-0.02			
	Mg	-0.16			

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	NC
Steel	Purple
Cu	Brown-orange
Mg	Grey

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 107. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 390°F

Sample Data

	Vis. cs/100°F	00°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.04	4.2	4.22	0.24	11.9			
24 hr	19.31	5.6	4.26	0.30	17.5			
40 hr	19.84	8.5	4.29	0.42	28.2			
48 hr	20.32	11.2	4.44	0.47	33.2	24	2.60	15.07

Metal Specimen Data

Weight change, ng/cm ² :	Al	10.06
	Ti	10.06
	Ag	0.0
	Steel	0.04
	Cu	-0.14
	Mg	-0.14

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Fe	Tan
Ag	White
Steel	Purple
Cu	Orange
Mg	Grey

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 108. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.20	5.0	4.23	0.31	10.8			
24 hr	19.52	6.8	4.30	0.40	19.3			
40 hr	20.35	11.3	4.44	0.53	35.4			
48 hr	21.17	15.8	4.52	0.54	42.4	32	2.47	15.02

Metal Specimen Data

Weight change, mg/cm²: Al
Ti
Ag
Steel
Cu
Mg

Test Cell Data

Sludge in oil: 200-mesh filter
Centrifuge
None
None
Tube deposits: Below oil level
At and above oil level
None
None

Metal discoloration, deposits,
pitting, or etching:

Al
Ti
Ag
Steel
Cu
Mg

Test Conditions

Sample temperature, °F
Sample volume, ml
Air rate, liter/hr
Condensate return
NC
Lt tan
NC
Blue
Green-orange
Slight etching
400
200
130
No

TABLE 109. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-25 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.76	--	5.3	0.0	--			
16 hr	29.98	4.2	5.5	0.07	1.8			
24 hr	30.54	6.2	5.60	0.09	2.5			
40 hr	31.31	8.9	5.72	0.13	3.7			
48 hr	31.80	10.6	5.77	0.15	8.3	12	1.89	21.51

Metal Specimen Data

Weight change, mg/cm ² :		Sludge in oil:	
Al	+0.06	200-mesh filter	None
Ti	-0.06	Centrifuge	0.05 ml/25
Ag	+0.04		
Steel	+0.06	Tube deposits:	Below oil level
Cu	-0.06		At and above oil level
Mg	-0.06		None
			Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	Lt tan
Steel	Blue-green
Cu	Brown
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 110. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-2, AT 385°F

<u>Sample Data</u>					
	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	28.76	--	5.36	0.0	
16 hr	30.01	4.3	5.54	0.11	
24 hr	30.53	6.2	5.59	0.14	
40 hr	31.23	8.8	5.68	0.14	
48 hr	31.74	10.4	5.74	0.15	12
<u>Metal Specimen Data</u>					
<u>Test Cell Data</u>					
Weight change, mg/cm ² :					
Al	0.0				
Ti	-0.02				
Ag	0.0				
Steel	0.0				
Cu	-0.16				
Mg	0.0				
Sludge in oil: 200-mesh filter None					
Centrifuge 0.05 ml/25					
Tube deposits: Below oil level None					
At and above oil level None					
<u>Test Conditions</u>					
Metal discoloration, deposits, pitting, or etching:					
Al	NC				
Ti	Lt tan				
Ag	NC				
Steel	Green-blue				
Cu	Orange				
Mg	NC				
Sample temperature, °F					
385					
Sample volume, ml					
200					
Air rate, liter/hr					
130					
Condensate return					
Yes					

TABLE III. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-25 AT 385°F

<u>Sample Data</u>					
	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	28.76	--	5.36	0.0	
16 hr	29.96	4.2	5.51	0.07	
24 hr	30.55	6.2	5.64	0.10	
40 hr	31.23	8.6	5.66	0.14	
48 hr	31.75	10.4	5.76	0.15	11
<u>Metal Specimen Data</u>					
<u>Test Cell Data</u>					
Sludge in oil: 200-mesh filter None					
Centrifuge 0.6 ml/25					
Tube deposits: Below oil level None					
At and above oil level None					
<u>Test Conditions</u>					
Sample temperature, °F 385					
Sample volume, ml 200					
Air rate, liter/hr 130					
Condensate return Yes					

TABLE 112. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 385°F

Sample Data		100°F Vis Increase, %		Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
Vis, cs/100°F								Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.77	--		3.10	0.33	--			
16 hr	16.33	27.9		3.62	0.24	49.6			
24 hr	18.21	42.6		3.88	0.29	65.7			
40 hr	22.74	78.1		4.48	0.36	86.7			
48 hr	26.70	109		4.97	0.41	92.3	54	1.37	9.39
Metal Specimen Data		Normal Clean-up		Electro-cleaned		Test Cell Data			
Weight change, mg/cm ² :		Al	0.0	-0.06		Sludge in oil:		200-mesh filter	None
		Ti	0.0	-0.02				Centrifuge	Trace
		Ag	-0.06	-0.06					
		Steel	0.0	-0.02		Tube deposits: Below oil level			
		Cu	-0.28	-0.36		At and above oil level			
		Mg	+0.20	+0.06		level			
						None			
Metal discoloration, deposits, pitting, or etching:		Test Conditions							
		Al	Lt yellow			Sample temperature, °F		385	
		Ti	Lt tan			Sample volume, ml		200	
		Ag	Lt yellow			Air rate, liter/hr		130	
		Steel	Brown-yellow			Condensate return		No	
		Cu	Brown						
		Mg	Yellow						

TABLE 113. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 385°F

Sample Data					
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	12.77	--	3.10	0.33	
16 hr	16.38	28.3	3.63	0.26	
24 hr	18.28	43.1	3.90	0.26	
40 hr	22.76	78.2	4.47	0.34	
48 hr	26.32	106	4.92	0.47	52
Metal Specimen Data					
Test Cell Data					
W ght change, mg/cm ² :	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	-0.02	Tube deposits: Below oil level At and above oil level		
	Steel	-0.04			
	Cu	-0.35			
	Mg	+0.06			None
Metal discoloration, deposits, pitting, or etching:					
Test Conditions					
Al	Lt yellow		Sample temperature, °F		385
Ti	Lt tan		Sample volume, ml		200
Ag	Lt yellow		Air rate, liter/hr		130
Steel	Yellow-brown		Condensate return		Yes
Cu	Slight pitting				
Mg	Yellow				

TABLE 114. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.77	--	3.10	0.33	--			
16 hr	16.75	31.2	3.76	0.28	53.7			
24 hr	18.89	47.9	4.02	0.33	71.2			
40 hr	24.19	89.4	4.67	0.39	93.2			
48 hr	29.04	127	5.28	0.46	98.9	58	1.26	9.26

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil: 200-mesh filter Centrifuge	None Trace
	Ti	0.0		
	Ag	-0.04		
	Steel	+0.04		
	Cu	-0.39		
	Mg	0.0		
	Tube deposits: Below oil level At and above oil level			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F 390
Ti	Lt tan	
Ag	Lt yellow	
Steel	Brown-yellow	
Cu	Brown	
Mg	Lt yellow	
		Sample volume, ml 200
		Air rate, liter/hr 130
		Condensate return No

TABLE 115. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-1 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.91	--	3.76	0.07	--			
16 hr	15.76	5.7	3.92	0.31	18.4			
24 hr	16.13	8.2	3.96	0.56	27.0			
40 hr	40.18	169	6.90	22.0	53.7			
48 hr	94.18	532	12.90	26.2	61.9	45	28.3	9.75

Metal Specimen Data

Normal Electro-
Clean-up cleaned

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	-0.06	Sludge in oil:	200-mesh filter	None
	Ti	-0.06	-0.06		Centrifuge	Trace
	Ag	0.0	0.0			
	Steel	0.0	0.0	Tube deposits:	Below oil level	Lt var
	Cu	-4.62	-4.65		At and above oil level	None
	Mg	-0.08	-0.12			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Blue
Cu	Severe etch
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 116. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-55-1 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	14.91	--	3.76	0.07	
16 hr	15.75	5.6	3.91	0.30	
24 hr	16.15	8.3	3.97	0.53	
40 hr	40.97	175	7.00	21.5	
48 hr	110.2	639	14.22	29.2	44

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	Trace
	Ag	0.0			
	Steel	0.0	Tube deposits:	Below oil level	Very lt var
	Cu	-3.73		At and above oil	
	Mg	+0.06		level	None

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Severe etch		
Mg	NC		

TABLE 117. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-1 AT 390°F

<u>Sample Data</u>											
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample				
							Acidity, mg KOH/g	Vis, cs/100°F			
Initial	14.91	--	3.76	0.07	--						
16 hr	15.86	6.4	3.92	0.42	22.3						
24 hr	16.22	8.8	3.97	0.85	32.6						
40 hr	73.23	391	11.01	24.3	64.9						
48 hr	373.0	2402	32.79	21.5	69.9	50	29.39	10.00			
<u>Metal Specimen Data</u>											
<u>Test Cell Data</u>											
Weight change, mg/cm ² :			Al	+0.02	Sludge in oil:			200-mesh filter	None		
			Ti	0.0				Centrifuge	Trace		
			Ag	-0.04							
			Steel	+0.04	Tube deposits:			Below oil level	None		
			Cu	-10.49				At and above oil level	Lt var		
			Mg	0.0							
<u>Test Conditions</u>											
Metal discoloration, deposits, pitting, or etching:			Al	NC	Sample temperature, °F			390			
			Ti	Lt tan	Sample volume, ml			200			
			Ag	Lt yellow	Air rate, liter/hr			130			
			Steel	Blue	Condensate return			No			
			Cu	Severe etch							
			Mg	NC							

TABLE 118. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-2 AT 385°F

Sample Data							Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.10	0.64	--				
16 hr	7.9	3.31	0.10	41.9				
24 hr	14.5	3.42	0.08	60.4				
40 hr	33.9	3.82	0.42	88.0				
48 hr	49.6	4.11	0.09	94.5	57	0.90	11.57	
Metal Specimen Data		Normal		Test Cell Data				
Weight change, mg/cm ² :		Clean-up	Electro- cleaned					
Al		-0.02	-0.06	Sludge in oil:		200-mesh filter		
Ti		-0.04	-0.04			Centrifuge		
Ag		-0.02	-0.06					
Steel		0.0	0.0	Tube deposits: Below oil level				
Cu		-0.41	-0.43	At and above oil level				
Mg		+0.10	+0.10	None				
Metal discoloration, deposits, pitting, or etching:		Test Conditions						
Al		NC		Sample temperature, °F		385		
Ti		Lt tan		Sample volume, ml		200		
Ag		Lt yellow		Air rate, liter/hr		130		
Steel		Lt tan		Condensate return		No		
Cu		Pits						
Mg		NC						

TABLE 119. RESULTS OF REFLUX OXIDATION-CORROSION TEST
CN O-65-2 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		13.34	--	3.10	0.64	
16 hr		14.41	8.0	3.31	0.08	
24 hr		15.37	15.2	3.45	0.10	
40 hr		18.04	35.2	3.84	0.08	
48 hr		20.13	50.7	4.16	0.06	55
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	-0.05		Centrifuge	Trace
		Ag	+0.04	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	-0.41			
		Mg	0.0			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	Lt yellow	Sample temperature, °F		385
		Ti	Lt tan	Sample volume, ml		200
		Ag	Lt yellow	Air rate, liter/hr		130
		Steel	Lt tan	Condensate return		Yes
		Cu	Pits			
		Mg	NC			

TABLE 120. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-2 At 390°F

<u>Sample Data</u>		100°F Vis		Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	<u>Overhead Sample</u>	
Vis, cs/100°F	Increase, %	Initial	cs/100°F					Acidity, mg KOH/g	Vis, cs/100°F
				3.10	0.64	--			
16 hr	9.2			3.41	0.09	47.5			
24 hr	17.5			3.49	0.06	68.0			
40 hr	41.5			3.97	0.06	96.1			
48 hr	60.4			4.36	0.07	101.5	60	0.92	11.57
<u>Metal Specimen Data</u>				<u>Test Cell Data</u>					
Weight change, mg/cm ² :				Al	0.0	Sludge in oil:		200-mesh filter	None
				Ti	0.0			Centrifuge	Insufficient
				Steel	+0.02	Tube deposits:		Below oil level	None
				Cu	-0.45			At and above oil level	None
				Mg	-0.04				
Metal discoloration, deposits, pitting, or etching:				Al	NC	<u>Test Conditions</u>			
				Ti	Lt tan	Sample temperature, °F		390	
				Ag	Lt yellow	Sample volume, ml		200	
				Steel	Lt tan	Air rate, liter/hr		130	
				Cu	Pits	Condensate return		No	
				Mg	NC				

TABLE 121. RESULTS OF NONREFLUX OXIDATION-COI ROSION TEST
ON O-65-3 AT 385°F

Sample Data							
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F
Initial	--	4.52	0.24	--			
16 hr	14.2	5.04	0.68	42.2			
24 hr	26.2	5.51	0.85	61.0			
40 hr	93.8	8.14	1.27	93.4			
48 hr	319	16.08	2.01	102.4	64	1.58	10.73
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				(a)			
Ti				Centrifuge			
Ag				None			
Steel				Tube deposits: Below oil level			
Cu				At and above oil level			
Mg				Lt var			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg							
Lt rose							
Lt purple							
Lt orange							
Blue-green							
Green-brown							
Lt brown							

(a) Insufficient sample.

TABLE 22. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-3 /T 385°F

<u>Sample Data</u>						
	<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>	
Initial	17.05	--	4.52	0.24		
16 hr	19.46	14.1	5.00	0.65		
24 hr	21.12	23.9	5.46	0.84		
40 hr	30.88	81.1	7.56	1.29		
48 hr	63.26	271	14.24	1.83	60	
<u>Metal Specimen Data</u>						
<u>Test Cell Data</u>						
Weight change, mg/cm ² :		Al	-0.04	Sludge in oil:	200-mesh filter	None
		Ti	-0.08		Centrifuge	(a)
		Ag	-0.02	Tube deposits: Below oil level At and above oil level		
		Steel	-0.02			
		Cu	-0.12			
		Mg	+0.02			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	Lt rose	Sample temperature, °F		385
		Ti	Lt purple	Sample volume, ml		200
		Ag	Lt orange	Air rate, liter/hr		130
		Steel	Blue-green	Condensate return		Yes
		Cu	Green-brown			
		Mg	NC			

(a) Insufficient sample.

TABLE 123. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 385°F

Sample Data							
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.28	0.15	-			
16 hr	10.2	5.66	0.37	0.7			
24 hr	12.2	5.72	0.38	1.1			
40 hr	15.1	5.80	0.42	1.9			
48 hr	15.8	5.86	0.50	2.3	9	(a)	(a)
Metal Specimen Data				Test Cell Data			
				Normal Clean-up	Electro- cleaned		
Weight change, mg/cm ² :				Al	0.0	0.0	Sludge in oil: 200-mesh filter
				Ti	-0.08	-0.08	Centrifuge
				Ag	0.0	-0.04	
				Steel	-0.02	-0.04	Tube deposits: Below oil level
				Cu	-0.26	-0.26	At and above oil level
				Mg	+0.14	+0.12	None
							None
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
				Al	NC		Sample temperature, °F 385
				Ti	Lt tan		Sample volume, ml 200
				Ag	Lt yellow		Air rate, liter/hr 130
				Steel	Blue		Condensate return No
				Cu	Brown		
				Mg	NC		

(a) Insufficient sample.

TABLE 124. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		27.92	--	5.28	0.15	
16 hr		30.84	10.5	5.67	0.35	
24 hr		31.35	12.3	5.72	0.35	
40 hr		32.11	15.0	5.83	0.40	
48 hr		32.21	15.4	5.86	0.45	9
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	-0.06		Centrifuge	None
		Ag	+0.06	Tube deposits: Below oil level At and above oil level		
		Steel	+0.02			
		Cu	-0.32			
		Mg	-0.02			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC	Sample temperature, °F		
		Ti	Lt tan	Sample volume, ml		
		Ag	NC	Air rate, liter/hr		
		Steel	Blue	Condensate return		
		Cu	Pits			Yes
		Mg	NC			

TABLE 125. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 390°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
<u>Vis,</u> <u>cm/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Overhead</u> <u>Wt. g</u>	<u>Oil Loss,</u> <u>wt %</u>	<u>Acidity,</u> <u>mg KOH/g</u>	<u>Vis,</u> <u>cs/100°F</u>
Initial	--	5.28	0.15	--			
16 hr	11.0	5.67	0.38	1.0			
24 hr	13.0	5.74	0.40	1.5			
40 hr	16.2	5.85	0.47	2.5			
48 hr	18.1	5.91	0.48	3.0	10	4.88	22 20
<u>Metal Specimen Data</u>				<u>Test Cell Data</u>			
<u>Weight change, mg/cm²:</u>				<u>Sludge in oil:</u>			
Al				200-mesh filter			
Ti				Centrifuge			
Ag							
Steel							
Cu				<u>Tube deposits:</u>			
Mg				Below oil level			
				At and above oil level			
				None			
				None			
				None			
				None			
<u>Metal discoloration, deposits,</u> <u>pitting, or etching:</u>				<u>Test Conditions</u>			
Al				<u>Sample temperature, °F</u>			
Ti				390			
Ag				<u>Sample volume, ml</u>			
Steel				200			
Cu				<u>Air rate, liter/hr</u>			
Mg				130			
				<u>Condensate return</u>			
				No			

TABLE 126. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	19.44	--	4.03	0.15	--				
16 hr	22.24	14.4	4.42	0.26	41.9				
24 hr	22.27	17.6	4.52	0.28	60.4				
40 hr	23.99	23.4	4.72	0.28	88.0				
48 hr	25.42	30.8	4.86	0.30	94.5	27	0.90	11.57	
Metal Specimen Data				Test Cell Data					
				Normal Clean-up	Electro-cleaned				
Weight change, mg/cm ² :				Al	-0.02	-0.02	Sludge in oil:	200-mesh filter	None
				Ti	-0.06	-0.06		Centrifuge	None
				Ag	-0.06	-0.08			
				Steel	-0.02	-0.04	Tube deposits:	Below oil level	None
				Cu	-0.79	-0.83	At and above oil level		
				Mg	+0.16	+0.12			
Metal discoloration, deposits, pitting, or etching:									
				Al	NC	Sample temperature, °F			
				Ti	Lt tan	Sample volume, ml			
				Ag	Lt yellow	Air rate, liter/hr			
				Steel	Blue	Condensate return			
				Cu	Brown	No			
				Mg	NC				

TABLE 127. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 385°F

<u>Sample Data</u>		<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		19.44	--	4.03	0.15	
16 hr		22.21	14.2	4.43	0.29	
24 hr		22.89	17.7	4.52	0.27	
40 hr		24.44	25.7	4.71	0.31	
48 hr		25.57	31.5	4.86	0.31	27
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	-0.06		Centrifuge	None
		Ag	+0.06	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	-0.81			
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan			
		Ag	NC			
		Steel	Blue			
		Cu	Pits	Sample temperature, °F		385
		Mg	NC	Sample volume, ml		200
				Air rate, liter/hr		130
				Condensate return		Yes

TABLE 128. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.44	--	4.03	0.15	--			
16 hr	22.41	15.3	4.45	0.31	18.7			
24 hr	23.18	19.2	4.55	0.31	27.7			
40 hr	25.20	29.6	4.82	0.30	44.4			
48 hr	26.87	38.2	5.03	0.31	51.7	32	1.80	17.26

Metal Specimen Data

Weight change, mg/cm ² :		Test Cell Data	
Al	0.0	Sludge in oil:	200-mesh filter
Ti	-0.02		Centrifuge
Ag	-0.04	Tube deposits: Below oil level	
Steel	+0.04		
Cu	-0.87		
Mg	-0.12	At and above oil level	None
			None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Blue
Cu	Brown
Mg	NC

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 129. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-S AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.07	--	4.08	0.01	--			
16 hr	19.54	2.5	4.12	0.08	5.3			
24 hr	19.82	3.9	4.16	0.15	7.9			
40 hr	20.16	5.7	4.32	0.19	12.5			
48 hr	20.52	7.6	4.26	0.21	14.4	16	1.51	17.36

Metal Specimen Data

Weight change, mg/cm²: Al +0.02
Ti +0.04
Ag +0.02
Steel +0.02
Cu -0.10
Mg 0.0

Test Cell Data

Sludge in oil: 200-mesh filter None
Centrifuge Trace

Tube deposits: Below oil level None
At and above oil level None

Metal discoloration, deposits,
pitting, or etching:

Al NC
Ti Lt tan
Ag NC
Steel Lt blue
Cu Orange
Mg NC

Test Conditions

Sample temperature, °F 385
Sample volume, ml 200
Air rate, liter/hr 130
Condensate return No

TABLE 130. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-8 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.07	--	4.08	0.01				
16 hr	19.58	2.7	4.12	0.08	4.3			
24 hr	19.79	3.8	4.15	0.15	6.2			
40 hr	20.19	5.9	4.22	0.19	9.4			
48 hr	20.52	7.6	4.26	0.20	10.8	16	1.32	17.54

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter Centrifuge	None 0.05 ml/25
	Ti	0.0			
	Ag	0.0	Tube deposits:	Below oil level At and above oil level	None None
	Steel	0.0			
	Cu	-0.10			
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F 385
Ti	Lt tan	
Ag	NC	
Steel	Blue	
Cu	Orange	
Mg	NC	Sample volume, ml 200
		Air rate, liter/hr 130
		Condensate return No

TABLE 131. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-8 AT 385°F

<u>Sample Data</u>		<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		19.07	--	4.08	0.01	
16 hr		19.56	2.6	4.11	0.08	
24 hr		19.78	3.7	4.17	0.13	
40 hr		20.19	5.9	4.23	0.21	
48 hr		20.50	7.5	4.26	0.21	15
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	0.05 ml/25
		Ag	0.0			
		Steel	+0.02	Tube deposits:	Below oil level	None
		Cu	-0.02		At and above oil level	None
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC			
		Ti	Lt tan			385
		Ag	NC			200
		Steel	Blue			130
		Cu	Orange			Yes
		Mg	NC			

TABLE 132. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-14 AT 385°F

Sample Data							
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g Vis, cs/100°F
Initial	17.71	--	4.67	0.24	--		
16 hr	19.57	10.5	5.08	0.70	39.1		
24 hr	21.41	20.9	5.47	0.88	56.8		
40 hr	23.07	30.3	5.29	10.12	88.2		
48 hr	119.9	577	16.04	28.9	101.7	60	5.55 10.64
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter Centrifuge			
Al				None			
Ti				(a)			
Ag							
Steel				Tube deposits: Below oil level At and above oil level			
Cu				Med var			
Mg				Med var			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F 385			
Ti				Sample volume, ml 200			
Ag				Air rate, liter/hr 130			
Steel				Condensate return No			
Cu							
Mg							

(a) Insufficient sample.

TABLE 133. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-14 AT 385°F

Sample Data

	<u>Vis, cc/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	17.71	--	4.67	0.24	
16 hr	19.40	9.5	5.01	0.66	
24 hr	20.88	17.9	5.36	0.84	
40 hr	23.05	30.2	5.15	13.19	
48 hr	97.83	452	14.01	30.7	58

Metal Specimen Data

<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Sludge in oil: 200-mesh filter
Al	Centrifuge
Ti	None
Ag	(a)
Steel	Tube deposits: Below oil level
Cu	At and above oil
Mg	level
	Med var
	Med var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Blue-green
Ag	Lt yellow
Steel	Peacock
Cu	Lt brown
Mg	Lt brown

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	Yes

(a) Insufficient sample

TABLE 134. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-15 AT 385°F

Sample Data				Overhead Sample			
Vis., cs/100°F	100°F Vis Increase %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis., cs/100°F
Initial	--	5.64	0.02	--			
16 hr	7.0	5.29	0.18	2.8			
24 hr	9.4	5.38	0.33	4.0			
40 hr	13.3	5.52	0.42	5.6			
48 hr	15.7	5.61	0.45	6.4	11	3.65	23.20
Metal Specimen Data				Test Cell Data			
Weight change mg/cm ² :				Sludge in oil: 200-mesh filter Centrifuge			
Al				Tube deposits: Below oil level			
Ti				At and above oil level			
Ag				None			
Steel				None			
Cu				None			
Mg				None			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg				385			
				200			
				130			
				None			

TABLE 135. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-15 AT 385°F

Sample Data						
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %	
Initial	27.20	--	5.04	0.02		
16 hr	29.13	7.1	5.29	0.20		
24 hr	29.85	9.7	5.40	0.30		
40 hr	30.56	12.4	5.52	0.42		
48 hr	31.58	16.1	5.63	0.45		11
Metal Specimen Data						
Test Cell Data						
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	+0.04		Centrifuge	None
		Ag	0.0			
		Steel	+0.02	Tube deposits:	Below oil level	None
		Cu	-0.06		At and above oil level	None
		Mg	0.0			
Test Conditions						
Metal discoloration, deposits, pitting, or etching:		Al	NC	Sample temperature, °F		385
		Ti	Lt tan	Sample volume, ml		200
		Ag	NC	Air rate, liter/hr		130
		Steel	Blue-green	Condensate return		Yes
		Cu	Orange-green			
		Mg	NC			

TABLE 136. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	26.69	--	5.13	0.20	--			
16 hr	28.63	7.3	41	0.20	2.1			
24 hr	29.23	9.5	5.45	0.31	2.8			
40 hr	30.24	13.3	5.59	0.48	3.9			
48 hr	30.82	15.5	5.59	0.54	4.3	9	7.01	20.23

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	0.0
	Steel	0.0
	Cu	0.0
	Mg	+0.04

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal coloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	NC
Steel	Blue
Cu	NC
Mg	Orange

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 137. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	26.69	--	5.13	0.20	
16 hr	28.62	7.2	5.39	0.21	
24 hr	29.26	9.6	5.47	0.31	
40 hr	29.95	12.2	5.56	0.51	
48 hr	30.84	15.5	5.67	0.59	10

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.04
	Ag	-0.02
	Steel	0.0
	Cu	0.0
	Mg	+0.02

Test Cell Data

Sludge in oil:	200-mesh filter Centrifuge	None
Tube deposits:	Below oil level At and above oil level	None None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	NC
Steel	Blue
Cu	Orange
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	Yes

TABLE 138. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Visc Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.55	--	4.61	0.21	--			
16 hr	19.68	12.1	5.06	0.72	38.6			
24 hr	21.59	23.0	5.50	0.81	55.2			
40 hr	29.19	66.3	7.10	1.23	83.0			
48 hr	43.59	148	10.06	1.85	92.2	59	1.87	10.91

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.02
	Ag	0.0
	Steel	0.0
	Cu	-0.12
	Mg	0.0

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Brown & green
Mg	Yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Dark var
	At and above oil level	Dark var

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 139. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-18 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		17.55	--	4.61	0.21	
16 hr		17.31	10.0	4.96	0.72	
24 hr		20.92	19.2	5.33	0.79	
40 hr		27.67	57.7	6.79	1.11	
48 hr		40.44	129	9.40	1.68	54
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		W	-0.02			
		Steel	0.0	Tube deposits:	Below oil level	Lt var
		Cu	-0.08		At and above oil	
		Mg	+0.10		level	Lt var
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	Lt yellow	Sample temperature, °F		
		Ti	Brown	Sample volume, ml		
		Ag	Lt yellow	Air rate, liter/hr		
		Steel	Blue	No condensate return		
		Cu	Lt green & yellow			
		Mg	Yellow			

TABLE 140. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-19 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.72	--	4.67	0.25	--			
16 hr	17.49	- 1.3	4.15	0.57	37.7			
24 hr	19.19	+8.3	4.44	0.72	52.3			
40 hr	24.38	+37.6	5.29	1.02	72.2			
48 hr	28.15	+58.9	5.85	1.29	76.3	45	1.68	9.18

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	-0.04
	Steel	0.0
	Cu	-0.18
	Mg	0.0

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Brown & green
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 141. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-19 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	17.72	--	4.67	0.25	
16 hr	19.09	7.7	4.91	0.71	
24 hr	20.45	15.4	5.25	0.82	
40 hr	25.52	44.0	6.32	1.02	
48 hr	26.21	47.9	5.82	10.49	52

Metal Specimen Data

Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	-0.02	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	-0.12			
		Mg	+0.08			
Metal discoloration, deposits, pitting, or etching:				Test Conditions		
Al		Lt yellow		Sample temperature, °F		
Ti		Brown & blue		Sample volume, ml		
Ag		Lt yellow		Air rate, liter/hr		
Steel		Blue		Condensate return		
Cu		L green & yellow				
Mg		Yellow				

TABLE 142. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-21 AT 385°F

Sample Data									
Vis, cs/100°F				100°F Vis Increase, %		Vis, cs/210°F		Overhead Sample	
Initial				--		3.76		Acidity, mg KOH/g	
16 hr				14.8		4.13		Vis, cs/100°F	
24 hr				25.2		4.39		mg KOH/g	
40 hr				55.4		5.13		cs/100°F	
48 hr				75.6		5.63		cs/100°F	
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :									
Al		0.0		Sludge in oil:		200-mesh filter		None	
Ti		+0.02				Centrifuge		None	
Ag		-0.04							
Steel		0.0							
Cu		-0.16							
Mg		-0.04							
Test Conditions									
Metal discoloration, deposits, pitting, or etching:									
Al		Lt yellow		Sample temperature, °F		385			
Ti		Brown		Sample volume, ml		200			
Ag		Lt yellow		Air rate, liter/hr		130			
Steel		Blue		Condensate return		No			
Cu		Brown & green							
Mg		NC							

TABLE 143. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-21 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	15.11	--	3.76	0.07	
16 hr	19.08	26.3	4.93	0.76	
24 hr	20.36	34.7	5.22	0.82	
40 hr	24.48	62.0	6.06	1.21	
48 hr	41.36	174	7.61	26.4	54

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	None
	Ag	-0.06			
	Steel	0.0	Tube deposits:	Below oil level	Dark var
	Cu	-0.27		At and above oil	
	Mg	-0.73		level	Dark var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F	385
Ti	Brown & blue	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Orange		
Mg	Yellow & pitted		

TABLE 144. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 0-65-23 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.62	--	3.15	0.20	--			
16 hr	17.34	37.4	3.87	0.32	53.0			
24 hr	20.50	62.4	4.31	0.56	68.5			
40 hr	27.44	117	5.21	0.81	79.4			
48 hr	30.46	141	5.57	0.84	80.1	52	1.13	7.90

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge	Trace
	Ag	0.0			
	Steel	0.0	Tube deposits:	Below oil level	None
	Cu	-0.02		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	Lt Yellow	Air rate, liter/hr	130
Steel	Peacock	Condensate return	No
Cu	Orange		
Mg	NC		

TABLE 145. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-23 AT 385°F

<u>Sample Data</u>						
	<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>	
Initial	12.62	--	3.15	0.20		
16 hr	17.02	34.9	3.85	0.32		
24 hr	20.18	59.9	4.28	0.56		
40 hr	27.72	120	5.25	0.85		
48 hr	31.24	148	5.70	0.86		50
<u>Metal Specimen Data</u>						
Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None	
	Ti	+0.02		Centrifuge	Trace	
	Ag	0.0				
	Steel	0.0	Tube deposits:	Below oil level	None	
	Cu	-0.04		At and above oil level	None	
	Mg	+0.02				
<u>Metal discoloration, deposits, pitting, or etching:</u>						
	Al	NC	<u>Test Conditions</u>			
	Ti	Lt tan	Sample temperature, °F 385			
	Ag	Lt yellow	Sample volume, ml 200			
	Steel	Peacock	Air rate, liter/hr 130			
	Cu	Orange	Condensate return Yes			
	Mg	NC				

TABLE 146. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-24 AT 385°F

Sample Data					Overhead Sample		
Vis., cs/100°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.17	--	0.13	--			
16 hr	16.04	5.7	0.09	34.2			
24 hr	16.82	10.9	0.21	48.3			
40 hr	18.73	23.5	0.54	70.7			
48 hr	20.35	34.1	0.64	77.9	45	1.07	11.69
Metal Specimen Data					Test Cell Data		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter Centrifuge	Trace Trace
					Tube deposits:		
					Below oil level		
					At and above oil level		
					None		
					None		
Metal discoloration, deposits, pitting, or etching:					Test Conditions		
Al					Sample temperature, °F		
Ti					Sample volume, ml		
Ag					Air rate, liter/hr		
Steel					Condensate return		
Cu					No		
Mg					385		
					200		
					130		
					None		

TABLE 147. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-24 AT 385°F

Sample Data						
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %	
Initial	15.17	--	3.72	0.13		
16 hr	15.94	5.1	3.82	0.09		
24 hr	16.66	9.8	3.95	0.22		
40 hr	18.37	21.1	4.22	0.54		
48 hr	19.79	30.5	4.48	0.62		42
Metal Specimen Data						
Test Cell Data						
Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200 -mesh filter	Trace	
	Ti	0.0		Centrifuge	Trace	
	Ag	0.0				
	Steel	-0.02		Tube deposits:	Below oil level	None
	Cu	-0.08			Az and above oil level	None
	Mg	0.0				
Test Conditions						
Metal discoloration, deposits, pitting, or etching:		Al	NC	Sample temperature, °F		385
		Ti	Lt tan	Sample volume, ml		200
		Ag	Lt yellow	Air rate, liter/hr		130
		Steel	Blue	Condensate return		Yes
		Cu	Orange			
		Mg	NC			

TABLE 148 RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-65-27 AT 385°F

Sample Data					Overhead Sample		
Vis., cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis., cs/100°F
Initial	--	3.99	0.26	--			
16 hr	12.8	4.38	0.60	44.0			
24 hr	24.8	4.76	0.73	63.0			
40 hr	107	7.26	1.30	93.4			
48 hr	1768	43.82	3.48	97.6	63	1.25	10.54
Metal Specimen Data					Test Cell Data		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter Centrifuge	None (a)
					Tube deposits:		
					Below oil level		
					At and above oil level		
Metal discoloration, deposits, pitting, or etching					Test Conditions		
Al					Sample temperature, °F		
Ti					Sample volume, ml		
Ag					Air rate, liter/hr		
Steel					Condensate return		
Cu							
Mg							

(a) Insufficient sample.

TABLE 149. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-27 AT 385°F

<u>Sample Data</u>		<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		15.19	--	3.99	0.26	
16 hr		16.82	10.7	4.32	0.63	
24 hr		18.24	20.1	4.61	0.89	
40 hr		25.38	67.1	6.06	1.10	
48 hr		49.59	226	10.66	2.27	58

<u>Metal Specimen Data</u>		<u>Test Cell Data</u>	
Weight change, mg/cm ² :		Sludge in oil:	200-mesh filter Centrifuge
Al	+0.02		
Ti	+0.02		
Ag	+0.02		
Steel	+0.02	Tube deposits:	Below oil level
Cu	0.0		At and above oil level
Mg	+0.18		

<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>	
Al	Lt yellow	Sample temperature, °F	385
Ti	Lt brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Orange		
Mg	Orange		

(a) Insufficient sample.

TABLE 150. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-28 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.94	--	3.27	0.30	--			
16 hr	14.85	14.8	3.45	0.22	25.1			
24 hr	25.73	98.8	4.79	6.23	38.1			
40 hr	418.8	3,136	27.86	17.22	65.0			
48 hr	1650	12,650	73.21	21.8	66.9	47	50.9	8.50

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil: 200-mesh filter	None
	Ti	-0.02		
	Ag	-0.12	Tube deposits: Below oil level At and above oil level	None
	Steel	+0.08		
	Cu	-0.18		
	Mg	+0.14		

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	NC
Ag	Lt yellow
Steel	Black
Cu	Orange
Mg	Grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 151. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-28 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		12.94	--	3.27	0.30	
16 hr		14.74	13.9	3.44	0.22	
24 hr		16.44	27.0	3.66	1.49	
40 hr		244.2	1787	19.70	16.15	
48 hr		861.7	6559	46.30	18.75	46
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Metal discoloration, deposits, pitting, or etching:	Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	+0.02		Centrifuge	None
		Ag	-0.18	Tube deposits: Below oil level At and above oil level		
		Steel	+0.06			
		Cu	-0.40			
		Mg	+0.08			
<u>Test Conditions</u>						
					Sample temperature, °F	385
					Sample volume, ml	200
					Air rate, liter/hr	130
					Condensate return	Yes

TABLE 152. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-31 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.40	--	3.23	0.08	--			
16 hr	15.37	14.7	3.54	0.22	34.1			
24 hr	16.42	22.5	3.68	0.36	47.3			
40 hr	19.25	43.7	4.10	0.61	66.5			
48 hr	21.30	59.0	4.39	0.65	72.0	43	1.23	10.25

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	0.0
	Steel	0.0
	Cu	+0.04
	Mg	+0.12

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt brown
Ag	Lt yellow
Steel	Blue-brown
Cu	Orange
Mg	Lt grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 153. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-31 AT 385°F

<u>Sample Data</u>					
	<u>Vis, cs/100°F</u>	<u>100°F Vis increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	13.40	--	3.23	0.08	
16 hr	15.31	14.3	3.53	0.22	
24 hr	16.36	22.1	3.68	0.36	
40 hr	19.06	42.2	4.07	0.61	
48 hr	21.12	57.6	4.35	0.65	44
<u>Metal Specimen Data</u>					
<u>Test Cell Data</u>					
<u>Weight change, mg/cm²:</u>		Al	0.0	Sludge in oil: 200-mesh filter	None
		Ti	+0.02	Centrifuge	Trace
		Ag	0.0		
		Steel	+0.02	Tube deposits: Below oil level	None
		Cu	+0.02	At and above oil level	None
		Mg	+0.04		
<u>Metal discoloration, deposits, pitting, or etching:</u>					
		Al	NC		
		Ti	Lt brown	Sample temperature, °F	385
		Ag	Lt yellow	Sample volume, ml	200
		Steel	Blue-brown	Air rate, liter/hr	130
		Cu	Orange	Condensate return	Yes
		Mg	Lt grey		
<u>Test Conditions</u>					

TABLE 154. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-114 AT 375°F

<u>Sample Data</u>					<u>Overhead Sample</u>			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	-	3.54	0.10	-	-	-	-	
16 hr	5.1	3.71	0.52	26.1	-	-	-	
24 hr	9.3	3.78	0.56	39.0	-	-	-	
40 hr	18.4	4.06	0.70	63.1	-	-	-	
48 hr	26.8	4.31	0.83	73.1	41	1.12	11.08	
<u>Metal Specimen Data</u>					<u>Test Cell Data</u>			
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter			
Al					Centrifuge			
Ti					None			
Ag					0.15 ml/25			
Steel					Tube deposits: Below oil level			
Cu					At and above oil level			
Mg					Lt var			
Metal discoloration, deposits, pitting, or etching:					None			
Al					Sample temperature, °F			
Ti					375			
Ag					Sample volume, ml			
Steel					200			
Cu					Air rate, liter/hr			
Mg					130			
					Condensate return			
					No			
					<u>Test Conditions</u>			

TABLE 155. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-114 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.53	--	3.54	0.10	--			
16 hr	14.61	8.0	3.78	0.63	33.4			
24 hr	15.11	11.7	3.85	0.67	49.2			
40 hr	17.26	27.6	4.39	0.91	79.5			
48 hr	20.64	52.5	5.00	1.19	91.8	55	1.43	11.20

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	Trace
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Purple	Sample temperature, °F	385
Ti	Dark purple	Sample volume, ml	200
Ag	Purple	Air rate, liter/hr	130
Steel	Purple-green	Condensate return	No
Cu	Brown		
Mg	Purple		

TABLE 156. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
CN 65-L-115 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.33	--	3.59	0.09	--			
16 hr	15.16	5.8	3.76	0.27	14.7			
24 hr	15.44	7.7	5.79	0.31	21.5			
40 hr	16.15	12.7	3.93	0.39	34.8			
48 hr	16.57	15.6	4.02	0.43	40.5	26	1.35	11.15

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.05 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	None
Metal discoloration, deposits, pitting, or etching:	Mg			
	Al			
	Ti			
	Ag			
	Steel			

Test Conditions

	Sample temperature, °F	375
	Sample volume, ml	200
	Air rate, liter/hr	130
	Condensate return	No

TABLE 157. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-115 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.33	--	3.59	0.09	--			
16 hr	15.34	7.0	3.78	0.34	18.0			
24 hr	15.71	9.6	3.84	0.40	26.3			
40 hr	16.74	16.8	4.04	0.48	41.0			
48 hr	17.55	22.5	4.19	0.49	47.2	35	1.36	11.19

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil	200-mesh filter	None
	Ti	-0.02	Centrifuge	0.30 ml/25
	Ag	-0.02		
	Steel	+0.02	Tube deposits: Below oil level	None
	Cu	-0.16	At and above oil level	Lt var
	Mg	-0.06		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt tan	Sample temperature, °F	385
Ti	Dark grey	Sample volume, ml	200
Ag	Tan	Air rate, liter/hr	130
Steel	Lt blue-green	Condensate return	No
Cu	Dark brown		
Mg	Grey-brown		

TABLE 158. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-116 AT 375°F

Sample Data							Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	4.29	0.11	--				
16 hr	5.4	4.49	0.56	15.3				
24 hr	8.8	4.57	0.66	21.9				
40 hr	13.5	4.78	0.88	33.9				
48 hr	16.8	4.89	0.98	39.0	27	2.21	11.04	
Metal Specimen Data				Test Cell Data				
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter				
Al				Centrifuge				
Ti				None				
Ag				None				
Steel				Lt var				
Cu				At and above oil level				
Mg				None				
Metal discoloration, deposits, pitting, or etching:				Test Conditions				
Al				Sample temperature, °F				
Ti				Sample volume, ml				
Ag				Air rate, liter/hr				
Steel				Condensate return				
Cu				No				
Mg				No				

TABLE 159. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1003(a) AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.81	--	3.80	0.10	--			
16 hr	15.92	7.5	4.00	0.54	20.0			
24 hr	16.28	9.9	4.06	0.56	29.1			
40 hr	17.37	17.3	4.29	0.64	45.5			
48 hr	18.22	23.0	4.45	0.84	52.4	33	1.58	11.06

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	0.0
	Steel	+0.04
	Cu	-0.06
	Mg	+0.08

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Lt var
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Grey
Ag	Lt tan
Steel	Blue
Cu	Lt yellow
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Blend (equal parts) of 65-L-114, 65-L-115, and 65-L-116.

TABLE 160. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1003(a) USING WATER-SATURATED AIR AT 375°F

Sample Data					Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.80	0.10	--				
16 hr	6.8	3.99	0.61	19.9				
24 hr	9.5	4.05	0.64	29.1				
40 hr	16.0	4.25	0.74	46.2	33	2.16	10.88	
48 hr	20.9	4.40	0.89	53.6				
Metal Specimen Data					Test Cell Data			
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter			
Al					Centrifuge			
Ti					None			
Ag					0.05 ml/25			
Steel					Tube deposits: Below oil level			
Cu					At and above oil level			
Mg					None			
Metal discoloration, deposits, pitting, or etching:					Test Conditions			
Al					Sample temperature, °F			
Ti					Sample volume, ml			
Ag					Air rate, liter/hr			
Steel					Condensate return			
Cu					No			
Mg					NC			

(a) Blend (equal parts) of 65-L-114, 65-L-115, and 65-L-116.

TABLE 161. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.54	--	4.24	0.15	--			
16 hr	18.79	13.6	4.64	0.60	34.7			
24 hr	20.33	22.9	4.96	0.64	50.4			
40 hr	26.26	58.8	5.99	1.03	75.3			
48 hr	32.34	95.5	7.06	1.47	82.0	50	1.57	9.94

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	Sludge in oil: 200-mesh filter Centrifuge	None Trace
	Ti		
	Ag		
	Steel		
	Cu		
	Mg	Tube deposits: Below oil level At and above oil level	None Lt var

Metal discoloration, deposits,
pitting, or etching:

<u>Test Conditions</u>	
Al	Lt purple
Ti	Brownish purple
Ag	Tan
Steel	Blue
Cu	Yellow-green
Mg	Grey
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 162. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	16.54	--	4.24	0.15	
16 hr	18.64	12.7	4.63	0.66	
24 hr	20.19	22.1	4.91	0.70	
40 hr	25.34	53.2	5.84	1.01	
48 hr	31.29	89.2	6.87	1.32	49

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifuge
	Ag		None
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		Lt var
			Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt brown	Sample temperature, °F	385
Ti	Brown-red	Sample volume, ml	200
Ag	Yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Yellow-green		
Mg	Lt grey		

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 163. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385° F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	16.54	--	4.24	0.15	
16 hr	18.70	13.1	4.64	0.69	
24 hr	20.17	21.9	4.90	0.70	
40 hr	24.82	50.1	5.74	0.98	
48 hr	29.59	78.7	6.51	1.37	50

Metal Specimen Data

<u>Test Cell Data</u>		
Weight change, mg/cm ² :	Al	Sludge in oil: 200-mesh filter
	Ti	Centrifuge
	Ag	
	Steel	Tube deposits: Below oil level
	Cu	At and above oil level
	Mg	None
		None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Brown-purple
Ag	Lt tan
Steel	Blue
Cu	Yellow-brown
Mg	Lt grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	Yes

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 164. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1011(a) AT 385°F

Sample Data									
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	28.38	--	5.35	0.14	--				
16 hr	30.62	7.9	5.63	0.04	4.0				
24 hr	31.33	10.4	5.71	0.06	5.4				
40 hr	32.35	14.0	5.89	0.07	8.0				
48 hr	33.37	17.6	6.00	0.08	8.9	13	1.73		18.05
Test Cell Data									
Weight change, mg/cm ² :									
Al				+0.06		Sludge in oil:		200-mesh filter	
Ti				-0.04				Centrifuge	
Ag				+0.04					
Steel				-0.02		Tube deposits:		Below oil level	
Cu				-0.73				At and above oil level	
Mg				-0.06				None	
Metal discoloration, deposits, pitting, or etching:									
Al				NC		Sample temperature, °F		385	
Ti				Tan		Sample volume, ml		200	
Ag				White		Air rate, liter/hr		130	
Steel				Gold		Condensate return		No	
Cu				Severe pitting					
Mg				NC					

(a) Blend (1:1) of O-64-13 and O-64-25.

TABLE 165. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1011(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.38	--	5.35	0.14	
16 hr		30.69	8.1	5.63	0.07	
21 hr		31.27	10.2	5.71	0.07	
40 hr		32.79	15.5	5.91	0.09	
48 hr		33.76	19.0	6.02	0.11	15
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	0.05 ml/25
		Ag	+0.04			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	-0.84		At and above oil	
		Mg	-0.02		level	None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	NC		Sample temperature, °F		385
	Ti	Lt tan		Sample volume, ml		200
	Ag	Lt grey		Air rate, liter/hr		130
	Steel	Brown		Condensate return		Yes
	Cu	Moderate etching				
	Mg	NC				

(a) Blend (1:1) of O-64-13 and O-64-25.

TABLE 166. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1020(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		27.88	--	5.17	0.17	
16 hr		29.89	7.2	5.43	0.06	
24 hr		30.70	10.1	5.59	0.07	
40 hr		32.20	15.5	5.74	0.14	
48 hr		33.18	19.0	5.86	0.15	17
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	+0.02	Tube deposits: Below oil level At and above oil level		
		Steel	+0.06			
		Cu	+0.10			
		Mg	0.0			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC	Sample temperature, °F		
		Ti	Lt tan	Sample volume, ml		
		Ag	Lt yellow	Air rate, liter/hr		
		Steel	Purple	Condensate return		
		Cu	Brown			
		Mg	NC			

(a) Blend (1:1) of O-64-2 and O-64-13.

TABLE 167. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1021(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.07	--	5.19	0.04	
16 hr		29.90	6.5	5.42	0.11	
24 hr		30.45	8.5	5.51	0.17	
40 hr		31.38	11.8	5.64	0.26	
48 hr		31.95	13.8	5.72	0.29	13
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	0.0			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	0.0		At and above oil level	None
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC	Sample temperature, °F		385
		Ti	Lt tan	Sample volume, ml		200
		Ag	Lt yellow	Air rate, liter/hr		130
		Steel	Blue-green	Condensate return		Yes
		Cu	Yellow-red			
		Mg	NC			

(a) Blend (1:1) of O-64-2 and O-64-25.

TABLE 168. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1025(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.19	--	5.23	0.12	
16 hr		30.01	6.5	5.47	0.05	
24 hr		30.76	9.1	5.57	0.10	
40 hr		31.75	12.6	5.75	0.15	
48 hr		32.54	15.4	5.84	0.17	15
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	None
		Ti	+0.06		Centrifuge	None
		Ag	-0.02	Tube deposits: Below oil level At and above oil level		
		Steel	+0.06			
		Cu	+0.08			
		Mg	+0.02			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan	Sample temperature, °F		
		Ag	Lt yellow	Sample volume, ml		
		Steel	Purple	Air rate, liter/hr		
		Cu	Brown	Condensate return		
		Mg	Lt yellow			

(a) Blend (equal parts) of O-64-2, O-64-13, and O-64-25.

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