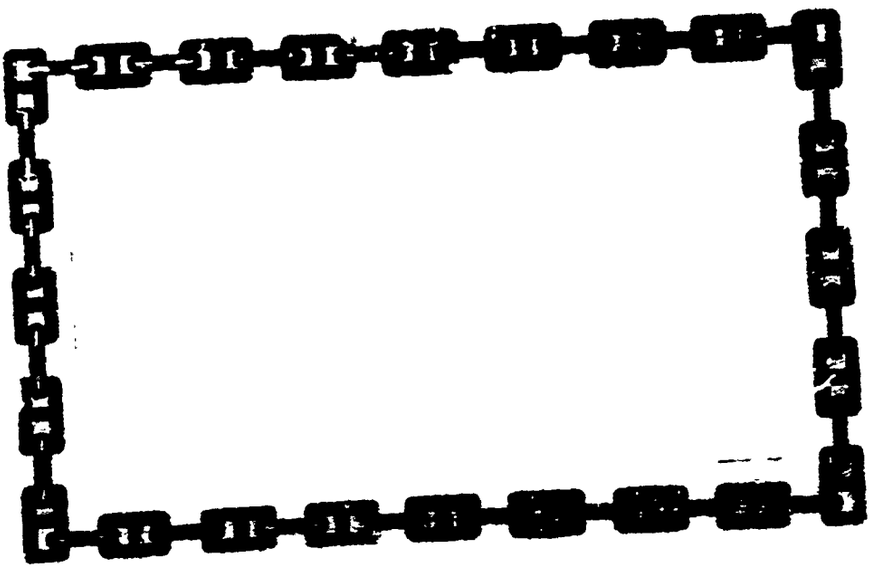
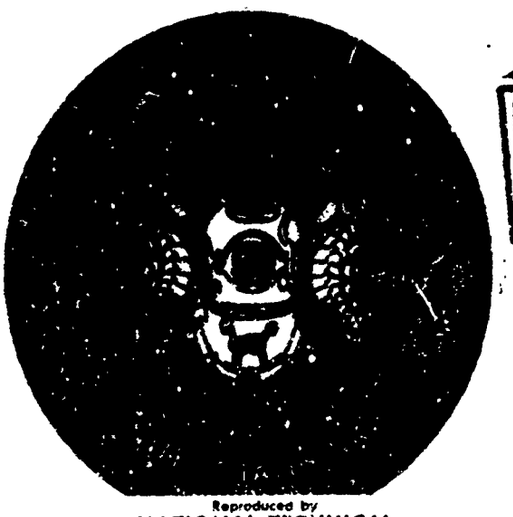
AD723258



NAVY EXPERIMENTAL DIVING UNIT



Approved for public release; distribution unlimited.

9

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Compressed Air Diving Navy Experimental Diving Unit						

Unclassified

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Officer in Charge Navy Experimental Diving Unit Wash. Navy Yard, Washington, D.C. 20390	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

Preliminary Volumetric Test of Light-Weight Diver's Model No. SK 375 Dapco Air Compressor, Test Two (2), Priority "B"

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final

5. AUTHOR(S) (First name, middle initial, last name)

G. G. MOLUMPHY

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
26 January 1948	6	

8a. CONTRACT OR GRANT NO. b. PROJECT NO c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) SRD 805/47 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. DISTRIBUTION STATEMENT

U.S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through Office of Technical Services, Department of Commerce, Washington, D.C.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Navy Experimental Diving Unit Washington Navy Yard Washington, D.C. 20390

13. ABSTRACT

DD FORM 1 NOV 65 1473 (PAGE 1)

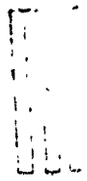
S/N 0101-807-6801

Unclassified

Security Classification

PRELIMINARY VOLUMETRIC TEST OF LIGHT-WEIGHT DIVER'S MODEL NO. SK375 DAPCO AIR COMPRESSOR, TEST TWO (2), PRIORITY "B"

26 January 1948



26 January 1948

U.S. NAVY EXPERIMENTAL DIVING UNIT

NAVAL GUN FACTORY

WASHINGTON, D. C.

Project No. - SRD 805/47.

Title - Preliminary Volumetric Test of Lightweight Diver's Model No. SK 375 Dapco Air Compressor, Test two (2), Priority "B".

G.G. Molumphy
Commander, USN
Officer in Charge

OBJECT OF TEST

The object of this test is to determine the free air output of a Dapco Air Compressor, model number SK 375 at 10#/in^2 back pressure increments, ranging from 10#/in^2 to a pressure where the volumetric efficiency approaches zero.

METHOD

The air compressor was a two stage, air cooled type. It was manufactured by Dapco Products, Inc., Defiance, Ohio. It was belt driven by a Wisconsin gasoline engine. The engine model was AK, size 2 7/8 x 2 3/4, serial number 639706, specification number 16864-3. The namufacturer's rating is 2.9 horsepower at 2200 RPMs.

The unit ran 14 hours with no load at various speeds to break it in. When the motor was first run, the speed was kept at a minimum.

Under load, an attempt was made to keep the revolutions per minute as close to 2250 as possible.

The compressor was fitted with 150 feet of 5/16 inch I.D. oxygen hose, terminating with a 1/4 inch throttling globe valve. After the throttling valve, the piping was increased to 3/4 inch. At this point, about 3 feet of 3/4 inch I.D. rubber tubing was connected to an air meter discharging into the atmosphere. Just prior to the meter, a pressure tap was inserted in the line. The load from this was connected to a water manometer. The meter used was a type generally used in household installations. It was manufactured by the American Meter Company, Albany, New York. The calibration was in liters and the correction factor was 0.984.

A test gauge was located just prior to the throttling valve and another one at the compressor. The back pressure was controlled by the throttling valve at the distal end of the hose.

The compressor was run under load for a period of about one hour in the course of these tests. Discharge volumes were measured by observing the flow in one minute. The intake air temperature was about 40°F. The safety valve on the air compressor was set at 115#/in^2. This was later set higher when tests were begun at 110#/in^2, back pressure. The unit was located outdoors where the temperature was about 40°F. All measurements were made indoors where the temperature was about 70°F. No air volume tank was used. The RPMs were measured by an instantaneous reading tachometer.

DISCUSSION OF RESULTS

The performance of this compressor with respect to its ability to deliver free air at high back pressures was satisfactory. It delivered 122 liters at 10#/in^2 back pressure and 95.5 liters at 110#/in^2 back pressure. This is a loss of but 21.5%. None of the volumes are corrected for standard temperature and pressure since the tests were of a preliminary nature. The meter correction factor of 0.984 and the pressure in centimeters of water above atmospheric at the adit side of the meter were also ignored, since their effect was small. The latter value at its maximum was only 5 centimeters.

Attention is invited to the high friction loss at low back pressures. This is as anticipated, since friction loss in pipes increases with velocity. The pressure gauge at the compressor was rather difficult to read because of its vibration.

The revolutions per minute had a plus or minus error of about 10. They too, were difficult to read due to the vibration of the compressor. An attempt was made to keep the RPMs at 2250. This was not possible at higher back pressures. There was a tendency of the unit to wander with regard to RPMs for no apparent reason. The effect was minimized by checks before each test when equilibrium conditions were established.

The heating of the compressor did not appear to be excessive. This was determined merely by touch. No attempt was made to evaluate this characteristic by positive tests. It is to be noted that the intake and ambient temperatures were about 40°F. This is a lower temperature than usually encountered in diving operations. The temperature of the air after throttling was not taken.

The compressor failed to produce a proportional volume of air when the back pressure was increased to 120#/in^2. All possible external causes were investigated such as obstructions, kinks in the hose, etc., without results. The compressor was then disassembled. The diaphragm of the high pressure side was found to be ruptured. The break occured about 1/4 inch from the outside of the diaphragm at the point where the under side of it touches the housing. Substantial wear was evident at this diameter throughout the diaphragm. The low pressure diaphragm was also inspected. There was also substantial wear at the same relative part of the diaphragm. It appeared as if it were in imminent danger of failure.

No other failures or shortcomings were evident in the compressor engine.

CONCLUSIONS

The volume of free air produced at back pressures up to 110#/in^2 is satisfactory. The volume drop from 10 to 110#/in^2 is but 21.5%.

The inadequacy of the diaphragms was indicated in the above tests. When the short period of operation is considered, (14 hours idling, 1 hour under load), this factor is all the more prominent. Moreover, the low ambient operating temperature placed the compressor in more favorable conditions than would be normally expected with regard to its heating.

The above results would point to a failure of material, faulty design, or a combination of both. Until these shortcomings are eliminated, this air compressor should not be considered for diving operations.

DATE : 22 January 1948

COMPRESSOR : Dapco, model number SK 375, air cooled, 2 stage, belt driven. Manfactured by Dapco Products, Inc., Defiance, Ohio

ENGINE : Model AK, size 2 7/8 x 2 3/4, serial number 839706, spec. number 16864-3. Develops 2.9 HP at 2200 RPMs

REMARKS : 150 feet, 5/16 inch I.D. oxygen hose used. In take air temperature - 40°F.

DATA OF DAPCO AIR COMPRESSOR TEST

Pres. at comp. #/in^2	24	30	38	50	53	63
Pres. at end of line #/in^2	10	20	30	40	50	60
RPMs	2250	2250	2250	2200	2200	2200
Free air disch. vol. ltrs/min.	122	120	120	118.5	116	111.5
Press. over atmos. at meter entrnc. cm/H_2O	5	5	4.5	4.5	4.5	4.4
Friction loss #/in^2	14	10	8	10	3	3

Pres. at comp. #/in^2	72	83	92	102	112	122
Pres. at end of line #/in^2	70	80	90	100	110	120
RPMs	2200	2200	2200	2150	2200	2150
Free air disch. vol. ltrs/min.	107	102.5	100	99.5	99.5	FAILED
Press. over atmos. at meter entrnc. cm/H_2O	4	4	3.5	3.5	3.3	
Friction loss #/in^2	2	3	2	2	2	2