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EFFICIENCY STUDIES ON 1967 AND 1971 ROCKET PROPELLANT CANISTERS

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March 1972

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by

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13. ABSTRACT

Mine Safety Appliance Company's Rocket Propellant Canisters, Model GMN-SSW, were tested using nitrogen dioxide (NO_2) and unsymmetrical dimethyl hydrazine (UDMH). Canisters manufactured in 1967 were compared to canisters made in 1971.

Results of this study indicate that there is no statistically significant difference between the absorbing capacities of the new and old canisters for both contaminants. Indicators on the new canisters were unsatisfactory for both UDMH and NO_2.

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II

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SECTION I

INTRODUCTION

The Mine Safety Appliance Company's Rocket Propellant Gas Mask Canister M15A1, is used by personnel exposed to fuels and oxidizers in Titan II operations. This canister provides protection against red fuming nitric acid, unsymmetrical dimethyl hydrazine (UDMH), hydrogen peroxide, organic vapors (e.g. kerosene, aniline, and alcohol). One of the built-in safety features of the canister is a small viewing window containing a color indicator that changes from orange to blue-green when the absorbing capacity is 50 to 75 percent depleted. The purpose of this study was to compare the capacities of unused 1967 and 1971 canisters. This study was requested by D. Tanner, WRNEMI. The concentration times time to a color change and to penetration at 1 ppm of NO_2 and UDMH was tested.

SECTION II

METHODOLOGY AND TEST PROCEDURE

Generating and test equipment for the study of NO_2 are shown in Figure 1. A dynamically calibrated Teledyne Olfactron was used to verify concentration levels of test gases at the mixing and effluent chambers which contain representative concentrations of both the canister inlet and outlet concentrations.

A fritted bubbler with auxiliary air flow was used in place of the impinger for UDMH vapor production.

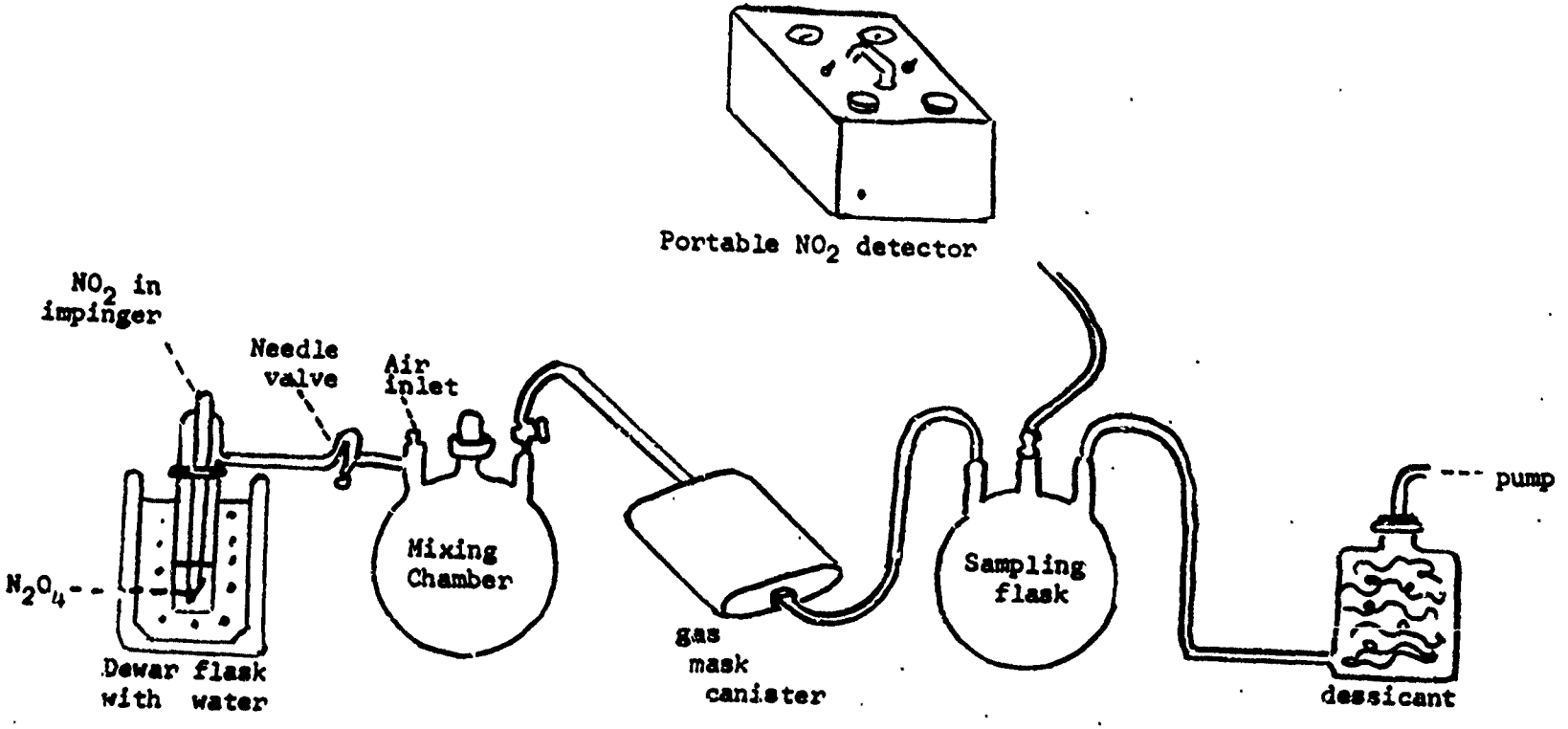
A steady flow of 38 liters per minute was maintained through the canister.

SECTION III

RESULTS AND OBSERVATIONS

The 1967 canisters had crystals within the indicator window that were larger than the ones in the new canister and the color was slightly off-orange (usually orange-black). Color changes before penetration with the new canisters were unsatisfactory and the color was described as yellow by several observers even after penetration had occurred at significant

FIGURE 1.


Portable NO_2 detector
NO_2 in impinger
Needle valve
Air inlet
N_2O_4
Dewar flask with water
Mixing Chamber
gas mask canister
Sampling flask
pump
dessicant

levels with both UDMH and NO_2 exposures. Results of testing are shown in Tables I and II below using test concentrations of 2,000-11,000 ppm.

TABLE I

NO_2 TESTING WITH GMN-SSW CANISTERS

Canister	Mfg. Date	ppm x min to Color Change	ppm x min to Penetration (1 ppm)
1	3/67	313,000	429,000
2	3/67	248,000	371,000
3	3/67	219,000	292,000
4	3/67	407,000	517,000
5	3/67	369,000	477,000
6	3/67	213,000	320,000
7	3/67	338,000	506,000
8	11/71	Unsatisfactory	398,000
10	11/71	Unsatisfactory	414,000

Making a pooled estimate of the variance on the Null Hypothesis that the two groups of canister samples (old and new) are drawn from an identical population, it has been calculated that the observed differences in the mean penetration values are statistically insignificant (t=0.169).

TABLE II

UDMH TESTING WITH GMN-SSW CANISTERS

Canister	Mfg. Date	ppm x min to Color Change	ppm x min to Penetration (1 ppm)
11	3/67	101,000	132,000
12	3/67	85,000	128,000
13	3/67	71,000	135,000
14	3/67	106,000	212,000
15	11/71	Unsatisfactory	106,000
16	11/71	Unsatisfactory	125,000
17	11/71	Unsatisfactory	193,000

Again a pooled estimate of the variance was made on the Null Hypothesis that the two groups of canisters (old and new) were drawn from an identical population and it has been calculated that the observed differences in the mean penetration values are statistically insignificant (t=0.26).

One of the old canisters had a badly off-color indicator and the penetration and indicator change were inconsistant with the results obtained on the other canisters. Penetration of UDMH occurred at 82,000 ppm x min with this canister.

SECTION IV

CONCLUSIONS

1. The canister absorbing capacity is not adversely affected by 5 years of storage if the indicator is still orange.

2. Indicators on the new canisters are unsatisfactory.

3. Results of this study due to refinements in technique do not indicate ppm x minutes penetration values previously obtained.