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O T T A W A September 27th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1500.

Examination of a Corroded Tin-Coated Water Filter.

(Copy No. 11.)

Bureau of Mines
Division of Metallic
Minerals
-
Ore Dressing
and Metallurgical
Laboratories

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

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Origin of Problem and Object of Investigation:

On September 4th, 1943, a corroded tin-coated water filter was submitted to these Laboratories by Mr. R. L. Martin, Inspector of Motor Transport, Inspection Board of United Kingdom and Canada, Ottawa, Ontario, who requested that the cause of corrosion be determined and that recommendations be made as to means of prevention.

This investigation is covered by Analysis Requisition No. O.T. 1428, dated September 18th, 1943, as arranged for (see letter of September 10th, File No. 12/4/16) by C. C. Pettet, for Inspector of Materials.

Macroscopic Examination:

Figure 1 is a photograph showing the filter as received, at approximately 1/6 size. Figure 2 shows ~~the~~ a corroded section, at approximately ¼ size.

A visual examination revealed that the corroded areas were covered with rust. Pits in the tin coating were also visible.

Microscopic Examination:

Samples were prepared for micro-examination. Pits in the section were found and Figures 3 and 4 are representative of this condition. Figure 4 also shows corrosion in the iron base under tin coating.

The thickness of coating was not uniform, being found to vary from 0.0004 to 0.0035 inch.

Discussion of Results; Conclusions:

1. From the visual examination, as well as from the microscopic examination, it is evident that the tin coating is porous. The existence of such pores in a tin coating is a common defect. Even a well-prepared surface is subject to this defect. However, a good means of preventing porosity is to increase the thickness of the coating.

2. Under normal conditions, porosity in tin coatings leads to preferential corrosion of the iron base. Tin does not normally afford anodic protection like zinc in galvanized iron. The well-known exception to this rule is the tin can, in which chemical conditions are such that tin possesses the ability to protect the iron base. In the present case, the dissolution and precipitation of iron shows that the iron has been corroded preferentially.

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Recommendations:

It appears, from the above considerations, that under the present conditions the use of a tin coating as an inhibiter of corrosion is rather dangerous (because of the porosity and the lack of protection of the tin on an iron base). The heavy thickness of the coating would mean that every economic precaution has been taken to minimize the porosity. The preparation of the surface might have been a contributing factor to the pitting of tin but no evidence of such a defect has been detected.

The safest procedure would be to change the material. The use of a paint coating or a copper tubing would be advisable.

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Figure 1.

PHOTOGRAPH SHOWING THE WATER FILTER "AS RECEIVED".

(Approximately 1/6 size).

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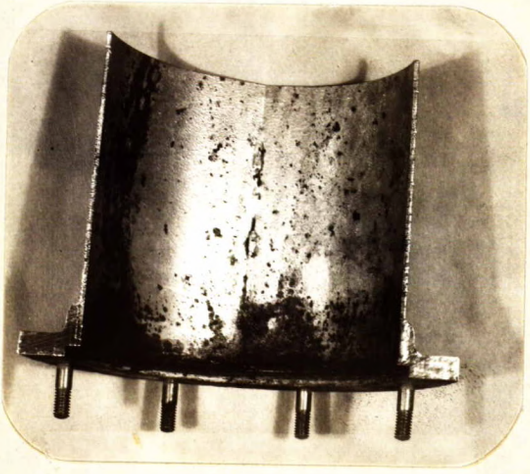
Figure 2.



SHOWING AN EXAMPLE OF INSIDE SURFACE CORROSION.

(Approximately ¼ size).

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Figure 3.

X100, unetched.

SHOWING POROSITY IN THE TIN COATING.

Figure 4.

X100, unetched.

SHOWING POROSITY AND CORROSION IN THE TIN COATING.

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