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O T T A W A

October 26, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1951.

Cause of Pitting of Magnesium Parts
During Application of Corrosion-
Resistant Coating.

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(Copy No. 10.)

Bureau of Mines
Division of Metallic
Minerals
Physical Metallurgy
Research Laboratories

CANADA
DEPARTMENT
of
MINES AND RESOURCES
Mines and Geology Branch

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Background:

A verbal request was received from Colonel E. C. Thorne, Director of Engineer Development, Department of National Defence (Army), Ottawa, Ontario, to investigate the cause of serious pitting which was produced on magnesium alloy 8X sheet and extrusions during application of a corrosion-resistant coating by the hydrofluoric acid-dichromate method. Colonel Thorne submitted coated magnesium parts which had been badly pitted and some which had been successfully treated without pitting. The samples were received on October 19, 1945.

Investigative Work:

The following investigations were performed:

- I. Sections of the pitted metal parts were examined under the microscope.
- II. Pitted and unpitted parts were analysed spectrographically.

Results:

I. Microscopic Examination.

The microscopic examination did not disclose any evidence of faulty metal.

II. Spectrographic Results.

The results of the spectrographic analysis are as follows:

(Page 3 contains the
(spectrographic results)
(in the form of a table.)

NATURE OF SAMPLE		COMPOSITION, PER CENT											
		Aluminium	Manganese	Zinc	Cadmium	Iron	Silicon	Lead	Tin	Copper	Silver	Nickel	Calcium
EXTRUDED	Unpitted.	7.6	1.15	0.84	0.001-	0.001	0.006	0.004-	0.002-	0.001-	N.d.	N.d.	N.d.
	Somewhat pitted.	5.4	0.29	0.87	0.001-	0.001	0.007	0.004-	0.002-	0.001-	N.d.	N.d.	N.d.
	Badly pitted. Later painted with zinc chromate primer.	6.7	0.6 to 1.5	0.81	0.001-	0.003	0.008	0.004-	0.002-	0.001-	N.d.	N.d.	N.d.
SHEET	Slightly pitted.	5.6	0.25	0.83	0.001-	0.001	0.005	0.004-	0.002-	0.001-	N.d.	N.d.	N.d.

N.d. = None detected.

(Results, cont'd) -

It will be noted that there is no relationship between degree of pitting and the content of the constituents, with the exception of iron and manganese.

Discussion:

1. It is felt that an iron content of 0.003 per cent would not be likely to interfere with the coating process.

2. There is a possibility, though not a probability, that a metal containing 0.6 per cent manganese at some points and 1.5 per cent at others might behave poorly in the coating treatment.

3. Indications are that the pitting was due either to an undesirable condition in one or more of the treatment tanks or to delay in completing the treatment.

Recommendations:

1. All work entering the process should be taken through all of the various stages without delay.

2. For the first few days after starting the coating process, the contents of each tank (including rinse tanks) should be analysed at least twice a day and a record kept of the results. Later, when the operators have gained more experience with the process, the analyses could be performed at less frequent intervals.

The contents of the rinse tanks should be analysed for total dissolved solids and pH.

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