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1 of 1

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- 1 -

7-3308

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300 AREA

January 15 through January 21

January 25, 1946

This document is a copy of
Page No. [redacted]

Extrusion

Extrusion was run on one day, January 17, with 274 BT and 81 G billets for a total of 355. The rods had a good external appearance.

The improved butt and fin shear was not tried further; this is considered quite promising and recommendations have been made that it be completed.

Production Test No. 30 to investigate cast material was completed in the field. The performance in the Test Pile was good.

Production Test No. 33 on reduced diameter rods is complete and a final report is being prepared.

Production Test No. 35 covering BT material showing abnormally poor FDS has been completed in the field through the Test Pile. Results, in general, are about as expected from preliminary information on the billets.

Tests and analyses of hard facing materials are proceeding.

A recommendation has been written for experimental work in outgassing for prevention of warp or dimensional instability by putting rods through at least one cycle of alpha-beta-alpha phases.

Experimental work on improvements to machining of slugs is proceeding in the field, with the aim of getting cleaner, smoother chips or ribbon turnings free from oxide, which will be beneficial in chip recovery and briquetting. Recommendations have been made for a one-week trial of the proposed procedure on one turret lathe.

Chip recovery equipment is being installed and a procedure is being prepared covering chip cleaning and briquetting.

Attention is being given to improvements in container cleaning to prevent buildup of hard scale and oxide.

Canning

High Tin Content of Canning Bath

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PR-24, 2-2-94

By Jessie Mally 4-20-94

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- 2 -

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During the past week, the tin content of the canning baths were reported excessively high on four shifts; whereas the limit for the concentration in the canning pot is set at 0.2%, the actual tin concentration was found on analysis to run as high as 0.36%. According to process specifications, such material is rejectable and would be automatically eliminated from production channels. However, since a large number of pieces were involved, it is believed desirable to check the actual tin content of the bonding layer. To accomplish this purpose, the jackets were stripped from several random samples; the total thickness of aluminum can and bonding layer, and the thickness of the bonding layer alone were measured by means of a filar ocular on a microscope. The stripped-off jackets were then submitted to the laboratory for drilling and analysis for tin content, from which data the tin content of the bonding layer alone may be calculated. Preliminary results indicate that the bonding layer in some instances is actually higher in tin than the established tolerance. Additional tests are to be run before final disposition of the canned pieces is decided.

Welding Troubles

Material canned on January 18 exhibited an unusual condition during the welding operation. Nearly every piece welded showed a tendency for the arc to strike down the side of the can from 3/32 to 1/8 inch below the weld bead. Wherever this phenomenon occurred, the canned surface was left rough and pitted although apparently not penetrated. While it is assumed that such material is not rejectable on the ground of penetrated jacket, it was considered an undesirable condition and an attempt was made to determine its cause. Comparative tests in which material canned on the succeeding day (January 19) were welded indicated that the latter material welded, in most cases, entirely satisfactorily without the appearance of the phenomenon described above. Two of the January 18 pieces were etched in fluosilicic acid following which they also welded satisfactorily although every other piece involved in the test which was canned on this date gave welding trouble. In addition, a large number of pieces were rejected for failure to produce a solid bead at welding, and subsequent examination of these defective pieces indicated that in every case the cap had failed to wet satisfactorily in the Al-Si bath. This evidence points to the assumption that some foreign substance had unwittingly been introduced into the preparation baths affecting cans and caps so that they wet poorly in the bath metal, and presumably coating the exterior of the can with a thin film of the extraneous material which resulted in the welding difficulties mentioned above. These pieces have not yet been put through frost test, but the appearance of an increased number of frost test rejects among these pieces is anticipated. Since all baths involved in the preparation of this material have been replaced with fresh baths for some time, no studies can be made of the suspected condition.

Thorium

A shipment of approximately 200 lbs. of thorium was received during the past week. This material is in extruded form and consists of four rods from 4 to 5 feet long which are to be cut up into 4-inch slug lengths. The rods are very crooked and require straightening of some sort before they can be machined into slugs. Since a principal requirement is that these slugs shall not be contaminated with uranium, it will be necessary to straighten the rods on an improvised straightening press and the slugs must be machined on a special lathe which has never been used for cutting uranium.

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- 3 -

7-3308

Bismuth

The latest shipment of bismuth slugs, comprising 200 lbs. of metal was found to run from 0.003 - 0.010 inch oversize in diameter and up to 0.035 inch oversize in length. Since it is impossible to insert these slugs in the regular B cans, it will be necessary to machine them to satisfactory dimensions. This operation is being carried out on a special lathe and an attempt is being made to save scrap turnings without contamination with uranium.

Nitrided Sleeves

Approximately 300 nitrided sleeves have now been accepted for use and 50 more have been nitrided but must be cleaned up before inspection. Meanwhile, the program of nitriding will be continued until the goal of 500 acceptable sleeves has been attained.

Under-Weight 305 MZ Rejects

It was previously reported that 5.05 lbs. should be taken for the minimum acceptable canned weight for MZ material. There are now approximately 485 pieces being held up for low results in the Test Pile, and individual weighing of these low test pieces indicated that most of them were under-weight. (i.e., below 5.05 lbs.). Five of these low-weight pieces were sectioned with the idea of determining whether low weight was due to porosity. Of these five, the piece having the lowest weight had the greatest diameter and showed the least indication of porosity. The other pieces showed greater indications of porosity but had somewhat smaller diameters. This bears out the previous indications that there is small correlation between weight and visible porosity of material.

Radiograph Results for Week Ending January 13, 1946

No. Pieces	48	Norms as of 12/8/45			
Type	MZ	181 1-1-1 MZ's			
% Showing Voids	66.7	40.9			
	Zone I	Zone II	Zone I	Zone II	
Average void area	0.04 cm ²	0.04 cm ²	0.0268 cm ²	0.0269 cm ²	
Average No. voids	0.8	4.3	1.0676	3.3649	
Total No. voids/48 pos.	24	138	21	67	
Maximum void area	0.20 cm ²	0.80 cm ²	0.3848 cm ²	0.3848 cm ²	

General Metallographic Studies

With the exception of the determination of solution rate of Al in Al-Si vs. composition and temperature above initial freezing point, most of the studies now being made are of necessity very superficial. They are being made purely to determine magnitudes of the various factors considered in order to insure dependability of results from subsequent production tests.

1. Thermal analysis of hyper-eutectic Al-Si Alloys:

These alloys apparently do not give as marked a change in slope in the cooling curves at the liquidus as do hypo-eutectic alloys. As a result, considerably

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7-3308

more care must be taken in order to get reasonable accuracy. Results of analyses made to date indicate an expected error at least twice that now assumed in control analyses of canning baths. The accuracy obtainable is, however, adequate for the purpose for which high Si alloys are to be used.

2. Effect of Mg in Al on solution rate and wetting of Al in Al-Si

With less than 0.1% Mg, (well beyond tolerance) there was no observable effect either on wetting or on solution rate. At 0.1% Mg and above, to the limit investigated, (0.5%) wetting remained unaffected, but solution rate in near-eutectic Al-Si was markedly decreased up to about 3 to 5°C above the melting point of the Al-Si. Near or above the melting point of the Al-Mg-Si eutectic (595°C) the solution rate was either unchanged or slightly increased over that of pure Al.

3. Date of Loss of Si from High Si Melts Standing in Air:

For the times that will probably be involved, loss of Si from a 13.5% Si melt was found to be slight -- less than the expected error in thermal analysis of such an alloy.

4. Rate of re-solution of pro-eutectic Si crystallites:

Five minutes after addition of a small ingot of 20% Si master alloy to an 11% Al-Si melt at 590°C, the melt was stirred and a small sample therefrom chill cast. No pro-eutectic Si crystallites could be found in the section made, so no trouble is expected from this source.

C. P. Kidder

C. P. Kidder, Asst. Chief Supvr.
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