AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

DECLASSIFIED

DUH-784

MUC-Rwy-36 184

This document consists of
5 pages and 0 figures.

TO: A. B. Greninger

FROM: R. W. Yancey

By Authority of RM-04en
CG-NMP-800 5-10-94

By J.E. Sawely 5-12-94

Verified By J. M. Mully 5-17-94

RF: Al-Si Canning Process Development
April 13 - 19, 1944

COPY 1 OF 1, SERIES 2A

Trial runs on two shifts are being made on the hydraulic canning furnace. The purpose of these trial runs is to familiarize the operators with the mechanical features of the canning furnace and to make the necessary changes required for easy manipulation.

Dipping Operation - Potentiometric checks on the bath temperatures showed the following differences in bath temperature vs. Wheelco instrument readings:

	<u>Actual Temp.</u>	<u>Wheelco</u>	<u>Difference</u>
Cu Sn	607	633	26°
Sn	609	630	21°
Al-Si	721	748	27°

The recommendations made by Wheelco Instrument Company regarding control of bath temperatures has been considered. Wheelco Company maintains that two controls are necessary; one to control undershooting and the other to control overshooting. They also recommend that the low fire should be eliminated and a pilot flame installed. This situation is to be investigated further.

Canning Operation - Checks on the time required for sleeves to come to heat in the new hydraulic furnace show it to be a minimum of 2 minutes at half the sleeve length. Furnace temperature was set at 610° C. On the aluminum can in a sleeve in the furnace the time required to come to heat is a minimum of 30 seconds. Furnace temperature was set at 610° C. The variation of temperature along the length of the can in the furnace varies as follows:

At the top of the Al can	572°-588° C.
" " middle of the Al can	609°-614° C.
" " bottom " " " "	588°-600° C.
" " bottom center of the Al can	586° C.

Readings were taken at 90° intervals around the can and at 1" distances down from the top. The indicated temperature of the pot at the center on the side wall was 615° C. The Wheelco control was set at 654° C.

Al-Si is wetting the 35-15 nickel-chrome lead pot on the hydraulic furnace. This condition is serious in that the I.D. of the hole is decreased and the Al-Si is hard to remove. Cleveland has found that a nickel liner works very well on this furnace. A new liner is being designed for the Chicago furnace.

A graduated bottom pour ladle is being designed to aid in experimental work and reduce the amount of Al-Si dross that is being poured into the cans.

Before the end of this week, experimental canning will start. On the basis of previous operations, a standard procedure has been set up and deviations from the standard procedure will be classed as experiments. After it is found by experimentation that some deviation is advantageous to the canning process the standard procedure will be changed accordingly. To start, the standard procedure will be as follows:

MASTER

DUH 784

- 2 -

Slug

1.259 + .004 diameter x 8" long
Turned surface finish
No corner radius
Pickled in 50-50% H₂O + 70% HNO₃
Time - 5 minutes
Temperature - 60-70° C.
Dried - Paper towels and air

Can

Inside Diameter 1.370"
Wall thickness .035"
Length - 8.75"
Cleaned in - 5 wt. % NaOH - 70 seconds
 3-1 70% HNO₃ - 48% HF - 3 seconds
Rinsed - Hot tap water
Dried - In air

Caps & Plugs

Plugs dimensions - 1.320" x .25"
Cap dimensions - 1.360" x .375"
Skirt - .125" height x .125" width
Cleaned - As per can

Sleeves

Steel - can type
Inside diameter - 1.450"
Outside diameter - 1.525"
Length - 9.0"

Cu-Sn Dip

47 wt. % copper - 53 wt. % tin
Bath temperature - 720° C.
Flux - 52% K - 43% Li - 5% Na
Time of slug in bath - 45 seconds

Sn Dip

99.9% tin - 1% aluminum
Bath temperature - 620° C.
Time of slug in bath - 20 seconds
Centrifuge for 5 seconds

Al-Si Dip

88% aluminum - 12% silicon
Bath temperature - 670° C.
Time of slug in bath - 2-3 seconds

DECLASSIFIED

Canning Operation

Temperature of canning furnace 610° C.
Time of sleeve in furnace 5 minutes
Time of can in sleeve 90 seconds
Speed of plunger 2.3" per second
Amount of Al-Si in can (Al-Si to be poured . 300 grams
into can just before slug is set in.) .
Quenching medium 80-90° water

Welding Operation

Shoulder to be cut back .0937"
to a depth of .0312"
50-60 Amperes current

Inspection

Assembled slugs are to be inspected by:

- (1) Frost Test
 - (a) % power level
 - (b) % area melted
 - (c) Number of spots melted
- (2) Dimensions
- (3) Vacuum Test
- (4) Deflection Test
- (5) Al-Si Test (Thru Can)
- (6) Visual Examination

DECLASSIFIED

Hereafter this procedure will be referred to as Standard Procedure No. 1.

Experimental Work

The program of experiments which will be performed will be listed below. Obviously some of them will be carried out simultaneously since they require no actual canning operation. These experiments will not necessarily be performed in numerical order but probably according to necessary information.

Experiments to be carried out are as follows:

Experiment #1 - Completely can, weld and inspect 50 slugs using Standard Procedure No. 1 and the new hydraulic canning furnace.

Experiment #2 - Study the effect of bath temperatures in regard to the temperature of the slug at the time of canning.

Experiment #3 - Study the effect of can temperatures in the furnace in regard to Al-Si coming through the wall.

Experiment #4 - Study the effect of variations in the preparation of aluminum parts.

- Experiment #5 - Canning of reclaimed W slugs.
- Experiment #6 - Removal of gases within the assembly by rolling.
- Experiment #7 - Determine the time required for Al-Si to come through a 2S Al can in the furnace at heat. No slug will be assembled.
- Experiment #8 - Study the effect of using a flame curtain over dipping baths to reduce amount of oxide on surface.
- Experiment #9 - Study the relation of thick lipped cans in regard to welding.
- Experiment #10- Study the effect of cutting various radii on W slugs.
- Experiment #11- Study the effect of vibration during assembly.
- Experiment #12- Study the effect of using Li free flux on Cu Sn bath.
- Experiment #13- Study the effect of quenching rate of assembly.
- Experiment #14- Study the possibility of eliminating Sn from the operation.
- Experiment #15--Study the effect of using Al-Si taken from a separate bath.
- Experiment #16- Study the effect of using a tapered Al cap in regard to wetting and subsequent welding.
- Experiment #17- Study the relation of slug diameter to canning.

There will probably be other experiments as development work progresses. The group will welcome any suggestions from other departments on the project.

Inspection Operations

This week has been spent in a thorough inspection of 131 Cleveland, Al-Si canned slugs. These were first welded, then frost tested, gauged and then tested for Al-Si penetration of the can.

The slugs were frost tested at the 65% power level with diphenyl. The Al-Si penetration was checked by immersing the slugs in 20% NaOH for 10 seconds and inspected for dark areas.

The following data is available at this writing:

No. of slugs	Tested	131
" "	Not Seated	9
" "	Passing Frost Test	77
" "	Welded Satisfactorily	96
" "	With Al-Si Penetration	57
" "	Holes in Can	38
" "	Passing all Tests but not Welded Satisfactorily	43
" "	Acceptable from All Tests and Welds	33

DECLASSIFIED

The frost test correlation between power levels for diphenyl and acenaphthene were checked this week and we find that 75% of the total melting power for acenaphthene is equivalent to 65% with diphenyl. Further runs with acenaphthene will be made at the 75% power level, instead of the 67½% used previously.

Twenty-five Al-Si bonded W plugs were placed in the steam auto-clave 4/19/44. These had been canned with Al-Si brazed plugs at the top and had not been welded.

Thirty Al-Si bonded slugs are being investigated for extent of Al-Si penetration of the can by machining 5 mils from the Al can and testing for Al-Si. A map will be made of the spots where penetration is found and the machining process again applied. These slugs will be machined and mapped until solid Al-Si is reached. The maps for each slug will then be juxtaposed and a contour map of penetration will be made for each slug.

R. W. YANCEY

RWY:lm

CC: A.B.Grenliger
Cooper-Chipman
J.N.Tilley (2)
Site B Library
W File
M.D.Whitaker
Technical File
F.Foote
J.P.Howe
W.W.Watson
N.Hilberry
Maj. Peterson
S.K.Allison
A.S.Weygandt
D.L.Schwartz
K.G.Jones (5)
RWY File

DECLASSIFIED

DATE

FILMED

8/15/94

END

1

2