

<Abstract>

(Title)

IMPROVEMENT IN RECOVERY PROCESS OF PRECIOUS METALS WITH A NEW CUPEL

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1. Introduction

In Niihama Copper Refinery, an English type cupel had been used for the recovery of precious metals. The introduction of a new cupel became necessary in order to meet the increasing anode production rate.

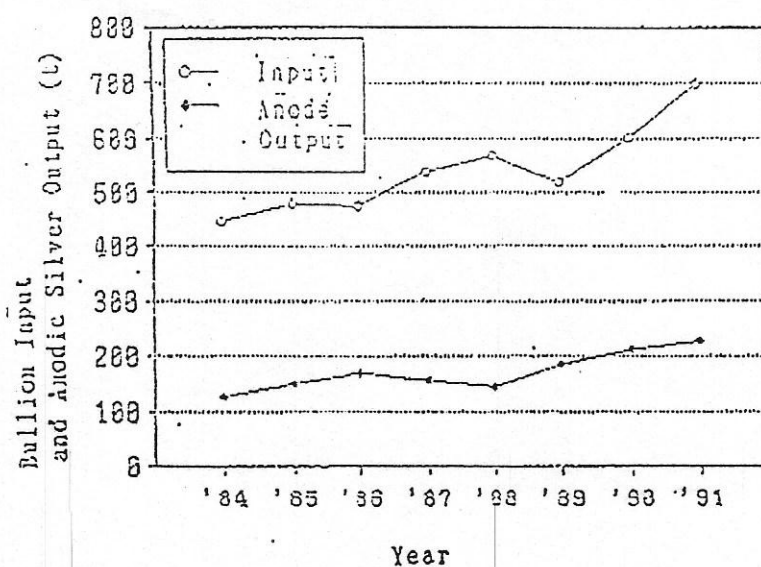


Fig. 1 Change of Bullion and Silver Anode Production with Cupel Operations

2. Operation of Old Cupel

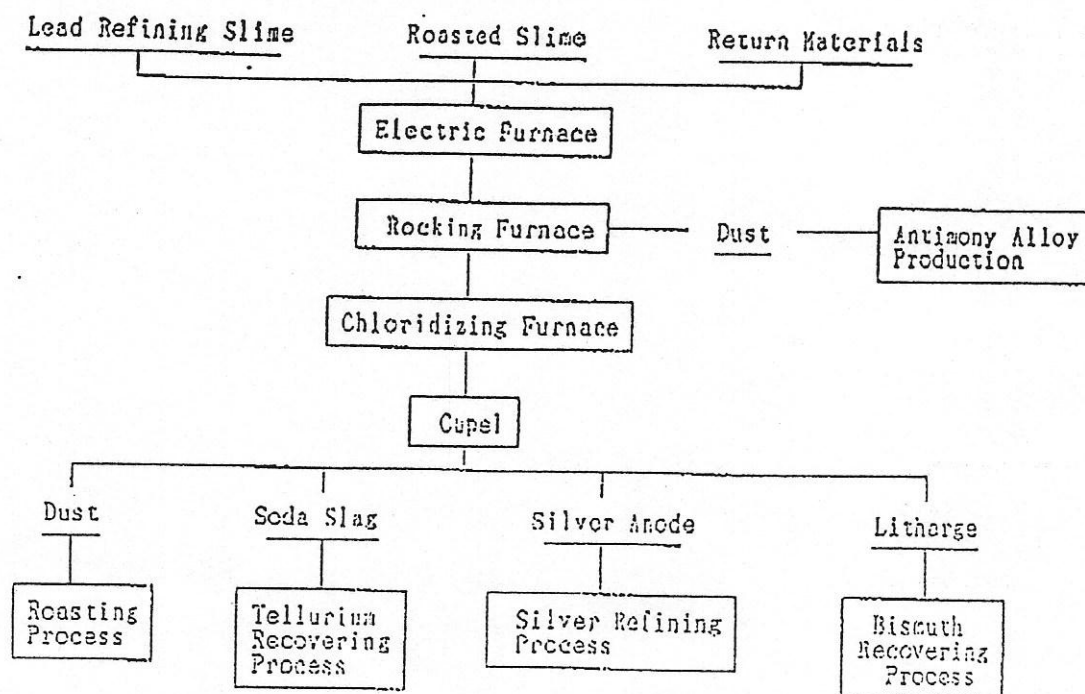


Fig. 2 Recovery Process of Precious Metals

Table 1 Composition of Input and Output

		%					
Materials		Au+Ag	Sb	Pb	Bi	Te	Cu
Input	Bullion	34.0	16.0	8.2	24.0	5.1	4.1
	Matte	22.2	0.8	15.0	1.0	11.4	29.0
Output	Silver Anode	23.0	tr.	0.3	0.1	tr.	0.7
	Litharge	3.9	10.6	12.5	36.6	1.8	8.7
	Soda Slag	4.1	5.6	9.4	20.5	15.6	12.4
	Dust	8.6	29.2	13.9	5.2	9.5	0.2

tr.: <0.01

Table 2 Specification of Main Equipments

Equipment	Specification
Cupel	Type: English Type Effective Volume: 0.25m ³ Melting Capacity: 1500kg/Batch, ss Silver Anode Heavy Oil Burner Lance Size: 50mm ϕ x (250mmH) Number of Lance: 3 Flow Rate: approx. 5m ³ /min./Lance Air Pressure: 0.8~1.2kg/cm ²
Bag Filter	Filtering Area: 925m ² Filter Material: Heat Resistant Nylone Cloth
Exhaust Fan	Air Flow Rate: 800m ³ /min. Air Pressure: 700mmAq
Silver Anode Caster	Number of mould: 50 Anode Volume of mould: 22 $\pm$ 2kg/Anode

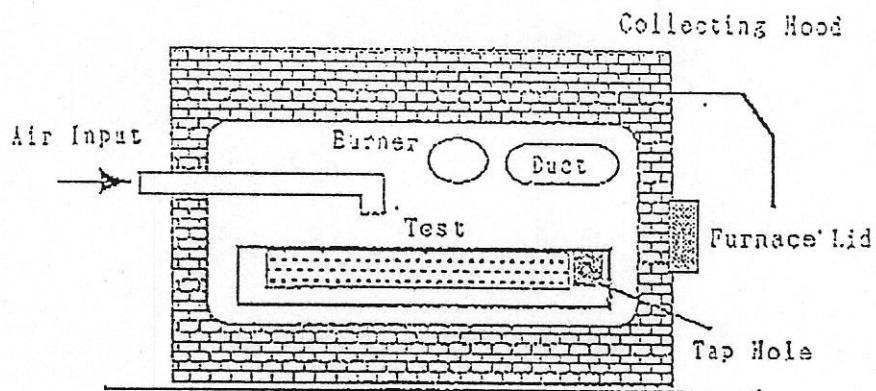


Fig. 3 Schematic Outline of English Type Cupel

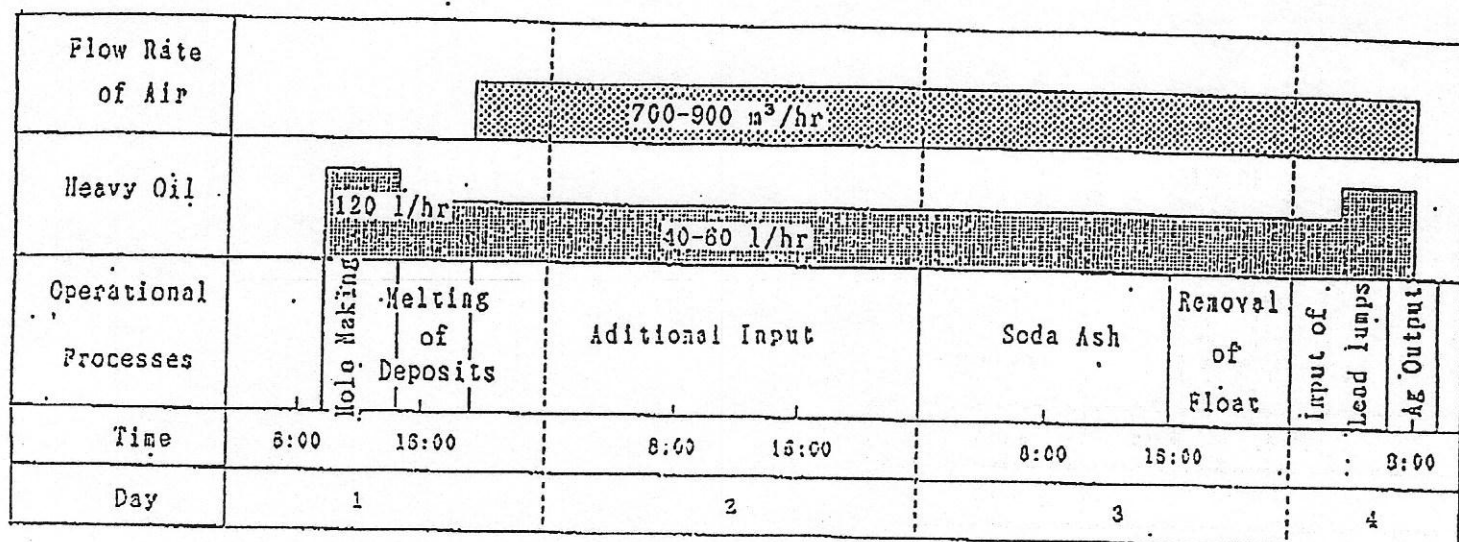


Fig. 4 Operational Procedure

3. Outline of New Cupel and Its Operation

BBOC (Bottom Blown Oxygen Cupel), which was developed by Britannia Refine Metals Ltd. was applied for the improvement of precious metal process in Nihama Refinery.

3.1 Specification of New Cupel

The capacity of new cupel is 3.5t-charge and it is 1.5 times as old one's.

Table 3 Main Specification of A New Cupel

Equipment	Specification
Cupel	Type: BBOC Efficient Volume: 0.36m³ Melting Capacity: Bullion 3500kg/Batch LPG Gas Burner Lance: Two Concentric Tube
Bullion Caster	Rolling Conveyer: Single Casting Ladle: 550mmφx300mmH, 500kg/Ladle

3.2 Operation

The operation cycle time, from charge to anode casting, is about 22 hours.

The outline of new process are :

- 1) Hard and hot work saving.
- 2) 500 kg bullion ingots are charged by overhead crane.
- 3) Discard litharges are put into pot and carried by crane.
- 4) Oxygen injection is achieved using a nitrogen shrouded lance at the bottom.
- 5) Litharge and refined silver and easily discharged by tilting the furnace and gas flow from the bottom.

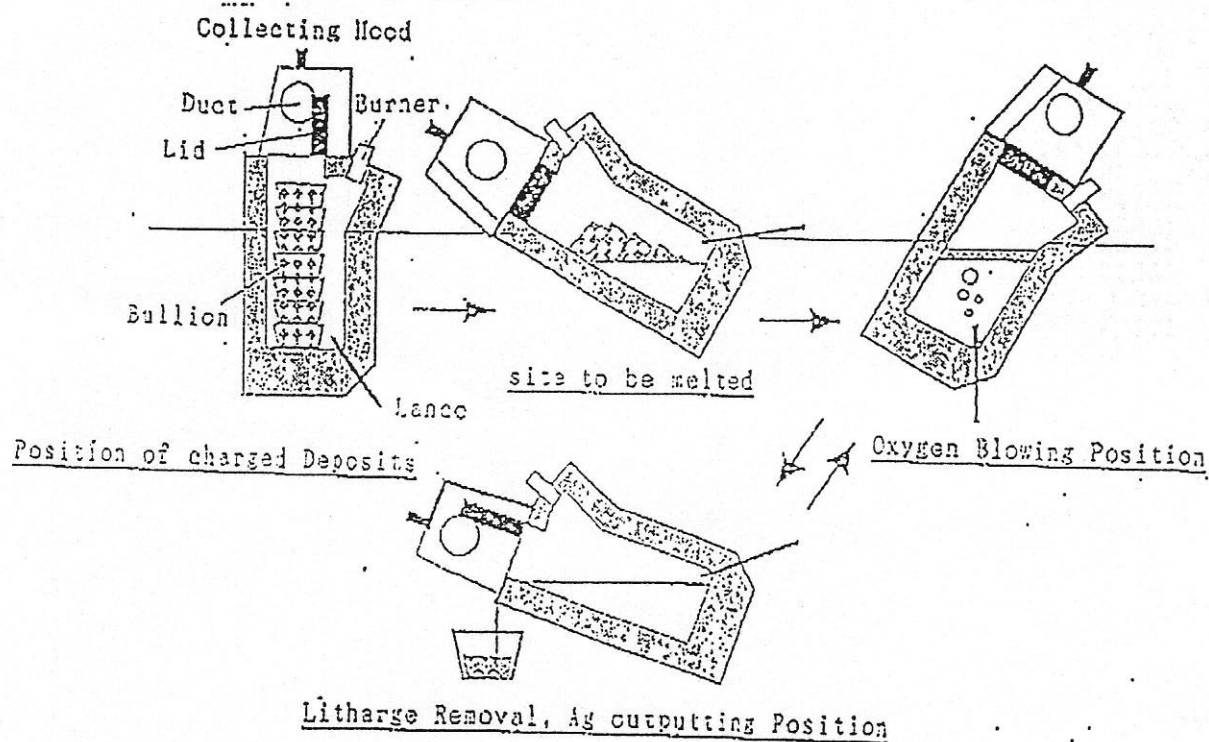


Fig. 5 Schematic Diagram Showing The Positions of Deposits, Oxygen Blowing and Litharge Removal

At early stage, the impurity contents in silver anodes are rather high. The purity of anode was improved stably with the introduction of computer modeling with sensual inspection of a sample button and oxygen pressure measurement. In the case of BEOC, the oxygen efficiency is extremaly high and the metallurgical balance is easily developed and available.

Oxygen consumption and soda ash and lead charge are controlled by the calculation output from a personal computer using the model.

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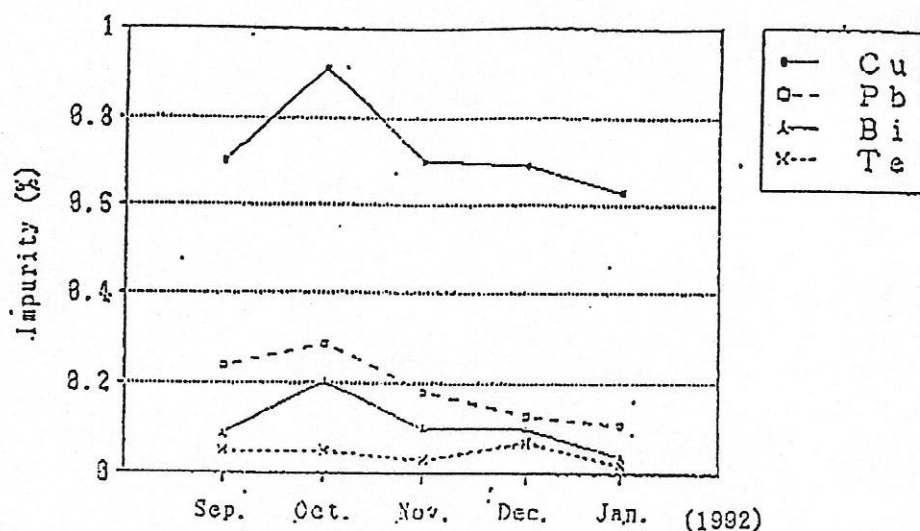


Fig. 6 Variation of Silver Anode Quality

3.3 Operation Result

Table 4 Operational Efficiency

Efficiency Factor		BBOC	Old Cupel
Bullion, Matte Treated	t/Batch	4.5	6.5
Silver Anode Produced	t/Batch	1.1	1.6
Time	hrs.	22	72
Oxygen Efficiency	%	85	8
Fuel Consumption	GJ/t-Ag	15	93
Exhausted Gases	m ³ /min.	120	800

4. Result of Improvement

This improvement by the introduction of BBOC saved hot and labor work drastically and realized the modernization of the cupellation in Niihama Refinery. Cost saving is assumed beyond 38 million yen a year.

- 1) Production rate becomes twice.
- 2) Reduction of inventory.
- 3) High energy efficiency.
- 4) Oxygen efficiency is above 85%.
- 5) Labor saving. 30 man-day/month.
- 6) Precious metal content in litharge is decreased.
- 7) Dust yield down from 15% to 10%.
- 8) High bismuth content in litharge makes bismuth process productivity higher.

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5. Summery and Acknowledgement

The improvement of precious metal process was carried out using BBCC. The basic study of cupellation process in research division and operator training in advance might be the reasons why we could use the new cupel operationally in a short time. We are going to develop the more efficient process to treat copper slime and lead slime in the plant.

We are greatly indebted to MM Technology Marketing Limited for providing us the permission to publish this report.