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N. Y. - #266

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DEPARTMENT OF JUSTICE
WAR DIVISION
ECONOMIC WARFARE SECTION

REPORT ON
KOBE SEIKOSHO K. K.
(Kobe Steel Works)

January 17, 1944

Submitted by:
Harvey Storch and
Harold Ungar
War Division
Department of Justice
New York, New York

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Economic Warfare Section
War Division
Department of Justice
Washington, D. C.

Confidential Report
January 17, 1943 (N.Y. #266)
Re: Kobe Seikoshō K. K.
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REPORT ON

KOBE SEIKOSHO K. K.

(Kobe Steel Works)

I. Introduction

Kobe Seikoshō (Kobe Steel Works) is one of the major Japanese steel and light metal producers. The company claims to have expanded "enormously" since 1937. Its capitalization, which was ¥40,000,000 in 1938, has risen to ¥90,000,000. (Company Report, July 1941, p. 13, as cited in A Directory of Certain Japanese Industrial Companies, by John Williams, O. E. W., August 1943, p. G-47.)

The information contained in this report comes from the order and inquiry files of the following Japanese trading companies vested by the Alien Property Custodian:

Mitsubishi Shoji Kaisha (referred to as M.S.K.)
Mitsui Bussan Kaisha (referred to as Mitsui)
Ataka & Co. (referred to as Ataka)

Additional information was extracted from the files of the Imperial Export Co., an American firm.

II. Kobe Steel Orders in the United States

All Kobe Steel orders placed in the United States are listed here, with detailed discussion of significant items following:

A. Tabulation.

1. Through M.S.K.

<u>Order Number</u>	<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
8126	2/24/38	Mesta	1	20 $\frac{1}{2}$ " x 49" x 80" 4-high cold mill	\$463,400.00 (OVER)

1.

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Order Number	Date	Manufacturer	No.	Product	Price
8525	7/28/38	Mesta	-	Shearing line equipment for above	\$57,570.00
8525A	9/23/38	Westinghouse	-	Shearing line equipment for above	3,608.99
8525B	11/9/38	Westinghouse	-	Shearing line equipment for above	1,302.78
8525C	11/15/38	Westinghouse	-	Shearing line equipment for above	431.20

2. Through Mitsui.

3001 EO 2802		Norton	1	#2 Universal tool and cutter grinder	1,892.97 C
3763 EO 1110	4/11/39	Ex-Cell-O	1	#112B Boring machine	6,439.39
3788 EO 2548	5/16/40	Ex-Cell-O	1	#1212 Boring machine	4,125.00
3789 EO 2567	5/16/40	Kearney & Trecker	1	#2204 Simplex milling machine	7,105.00 C
3790 EO 2546	5/24/40	Norton	1	#2 Universal tool and cutter grinder	2,916.10 C
3791 EO 2545	5/24/40	Norton	2	#1 Tool and cutter grinders	3,786.20
3973 rev. EO 2264	12/31/37	Kearney & Trecker	1	#4K Vertical milling machine	8,970.00
add				Rotary table and accessories	

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Order Number	Date	Manufacturer	No.	Product	Price
3994 EO 1792	9/27/39	American Tool Works	1	Hole Wizard radial drill	\$4,294.87
3998 EO 2323	12/10/37	Kearney & Trecker	1	#2K Vertical milling machine	5,825.50
7903 EO 2849	3/13/40	Bartlett Hayward	4	#2 Fast standard type flexible couplings	142.64

3. Through Ataka.

5381	9/14/37	Brown & Sharpe	1	3" x 18" #5 Plain grinding machine	2,372.63
V-7545	2/20/40	Reed Prentice	1	#6 Die sinking and vertical milling machine	17,023.00
V-7557	2/23/40	Brown & Sharpe	2	#2A Universal milling machines C	11,991.00
V-7562	2/23/40	Gleason	1	12" Straight bevel gear generator	9,795.00

4. Through Imperial Export Co.
(For the Toba Plant)

12472	10/23/37	Knight	1	#3B Milling machine	2,618.00
12488	10/23/37	Potter & Johnston	1	#6A Automatic chucking machine	3,213.00
12489	10/23/37	Potter & Johnston	2	#5A Rebuilt automatic chucking machines	1,927.80
13565	5/28/38	Rockford Machine Tool Co.	1	12" Shaper	1,838.00

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<u>Order Number</u>	<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
13567	5/28/38	Continental Machine Specialities	1	Do-All metal master sawing machine	\$1,112.00
14750	9/9/39	Continental Machine Specialities		Spare band saws for contour sawing machine	16.32 C
14779	1/12/40	Continental Machine Specialities	29	Band saws for Do-all sawing machine	16.32
15794	3/5/40	Continental Machine Specialities	30	Band saws for Do-all sawing machine	16.88

B. Discussion

The main duraluminum plants of Kobe Steel are located at Moji and Chofu, two towns situated within a few miles of each other, on opposite sides of Shimonaseki Strait. It is upon these two plants that the expansion plans were concentrated.

In July, 1938, W. W. Powell of Mesta visited Moji and after interviewing Messrs. Machinaga and Tshima of Kobe Steel, sent back the following report:

"The existing equipment at Moji includes:

- 1 - 20" x 28" x 70" Three High Hot Mill
- 1 - 36" x 90" Two High Hot Mill (under construction)
- 1 - 20 $\frac{1}{2}$ " x 49" x 80" Four High Cold Mill (under construction) (Supplied by Mesta)
- 4 - Two High Finishing Mills

"They desire the following tonnage:

- 1,000 metric tons per month of finished duraluminum
- 15% - 600 mm. (23.62") to 1,000 mm. (39.37") -
150 metric tons
- 70% - 1,000 mm. (39.37") to .6 mm. (.023") thick -
700 metric tons
- 15% - Over 1,000 mm. (39.37")

"On their present hot mill equipment they will produce breakdowns for their present two high finishing mills and also the Mesta 80" four high mill. Their present three high hot mill operates at 40 r.p.m. and is equipped with tilting tables.

"They will roll hot roll from 300 to 500 metric tons a month on this equipment from 6" ingots to 8 mm. slabs and from 8" ingots to 1/2" slabs.

"They may install part of the 60" to 90" mills mentioned in Inquiry No. 666 but will try to satisfy all their tonnage on their present two high finishing mills, the 80" single stand four high and the new tandem cold mill and additional hot capacity to supply the tandem mill. They have a demand for about 150 tons up to 90" wide.

"For annealing, they will use coke oven gas and Mr. Tshima thinks a radiant tube furnace would be a possibility. Electric power is expensive in Moji.

"For solution heat treatment they will use a soda bath followed by a cold water rinse."

In 1938, Mesta Machine Co. built a 20 $\frac{1}{2}$ " x 49" x 80" four high cold mill for the Chofu plant, and sold it to Kobe Steel at a cost of \$463,400.00. (M.S.K. Order #8126) The equipment was arranged to roll the duraluminum in sheet form until it was reduced to 3.0 mm. thick after which it was to be coiled in the three roll-up coiler and was to be further reduced to approximately 1.6 mm. thick. From approximately 1.6 mm. to .3 mm., the coils were to be reduced under tension. For this mill, Mesta also supplied shearing line equipment at a cost of \$62,912.97. (Orders #8285, #8285A, #8285B, #8285C) There is a letter in the order folder dated October 17, 1940 which states that Kobe Steel had been operating the mill successfully for about a year. There were some minor difficulties in the beginning, but after a year, they were operating the mill successfully.

This is the only rolling mill which was shipped to Kobe Steel by Mesta.

Complete specifications are included in the appendix as Exhibit No. 1. The file contains a complete set of blueprints.

III. Orders Outside of the United States

The following orders are revealed by the Mitsubishi "Confidential Reports". These reports are fragmentary and cannot be presumed to give a complete picture:

<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Material</u>	<u>Price</u>
1st half of November 1938	Hydraulik, A.G.	1	Forging press	\$1,437,457.50
2nd half of March 1939	Mitsubishi Denki	1	Electrolific furnace	51,000.00
1st half of June 1939	Schloemann, A.G.	1	Extrusion press (for Moji plant)	668,571.43

IV. Inquiries in the United States

Significant items in the Kobe Steel inquiries are discussed following the tabulation.

A. Tabulation

1. Through M.S.K.

<u>Inquiry Number</u>	<u>Date</u>	<u>Manufacturing</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
NY 165	2/36	United Engineering	1	Continuous sheet and tinplate mill	
NY 726	2/13/37	Combustion Engineering Co.	-	Fusion welded water tube boiler drums (File contains drawings)	
NY 965	5/6/37	Niles-Bement- Pond	1	Ingot slicing machine (Inquiry also to Wagner & Co., Germany)	
NY 1330	12/6/37	United Engineering	1	Roll grinder for rolls 20 $\frac{1}{2}$ " diameter x 80" face x 13'5" length, or	
			1	Roll grinder for rolls 48 $\frac{1}{2}$ " diameter x 80" face x 16' length	
NY 1625	8/18/38	Mesta	-	Hot and cold duralumin rolling mills	

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Inquiry Number	Date	Manufacturer	No.	Product	Price
NY 1793	3/8/39	Mesta	-	2-high and 3-high mills	
NY 2283	9/9/39	Mesta	2	28" x 13" x 48" 3-high duralumin cold mills	
			2	28" x 48" 2-high duralumin cold mills	
			1	20" x 39 3/4" x 32" 4-high duralumin cold mills	
NY 2400	4/29/40	Mesta	1	Piercing mill for non-ferrous metals	
NY 2426	9/8/39	Mesta	1	5,000 ton hydraulic forging press and equipment. (Had originally been ordered from Hydraulik in Germany, but German delivery could not be expected.)	
NY 2429	10/17/39	Mesta	2	Bevel gears for wire rod mill. (Kobe has a wire rod mill built by Krupp)	
NY 2531	10/2/39		1	Die forging press	
NY 2665	3/14/40	Mesta	1	Blooming mill	
NY 2666	3/11/40	Mesta	1	10,000 ton forging press (Previously ordered from Hydraulik, apparently. See M.S.K. Confidential Reports)	
NY 2701	4/5/40	Fellows	1	#7120 Gear shaper	
			1	#75A " "	
NY 2786	6/8/40	Mesta	3	Rolls for 80" 4-high cold mill	
			2	Back up roll chucks	
			1	Bottom thrust bearing frame	
			4	Oil bearings	
			2	Roller thrust bearings	
NY 2825	5/31/40	Mesta	-	Water-cooled book type mold for casting duralumin ingots	

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<u>Inquiry Number</u>	<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
NY 2929	8/9/40	Salem Engin- eering Co.	1	Reheating furnace for high carbon steel ingots or billets - capacity 20 tons per hour	
NY 3040	4/12/40		1	3-high mill to roll light alloys in hot state	
			1	2-high mill to roll light alloys in hot state	

2. Through Mitsui

TE 2499	9/20/37	United Engin- eering	1	4-high cold duralumin sheet mill. Max. size of products - 1 mm. x 1800 mm. x 5000 mm. (Inquiry also sent to Demag in Germany)	
TE 2616	9/12/39	United Engin- eering	2	Three high cold mills complete with reduction gear and motor for pro- ducing sheets of 0.3 mm. thick x 1,200 mm. wide x 2,000 mm. long from material 6.0 mm. - 10 mm. thick	
			2	Two high cold mills com- plete with reduction gear and motor. Product - same as above	
			1	Two high reversing strip mill complete with reduc- tion gear and motor for producing strips of 0.3 mm. thick x 600 mm. wide x 20 mm. long from material of 6 mm. - 10 mm. thick	

(Shibaura United Engineering Co. submitted
quotations:

2	32" x 20" x 66" three high mills	\$184,500.00
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Inquiry Number	Date	Manufacturer	No.	Product	Price
			2	32" x 66"	\$136,150.00
			1	two high mills 14" x 26 $\frac{1}{2}$ " x 32" four high cold strip and sheet mill	131,450.00
				No information on final outcome)	
TE 3021	10/13/40	Ajax Mfg. Co.	1	Upset forging machine	100,625.00
TE 3106	1/8/40	Ex-Cell-0		No. 74 Center lapping machine	656.00
TE 3107	1/8/40	Cleveland Hobbing Machine Co.		No. 135 single spindle rigid- hobber	7,610.00
TE 3108	1/8/40	Norton	1	10" x 72" Type "C" plain grinder for cam grinding (Blueprints of camshaft)	10,789.00
TE 3112	1/8/40	LaPointe	1	#3 $\frac{1}{2}$ Horizontal broaching machine	5,500.00
TE 3113	2/21/40	Ex-Cell-0	1	#1212 "Junior" double end boring machine for cast iron and aluminum pistons (Blue- prints of pistons)	7,060.40
TE 3114	1/8/40	Kearney & Trecker	1	#2204 Milwaukee vertical Universal milling machine	16,650.00
TE 3372	4/28/39	Foot-Burt	1	3 Spindle vertical stub cylinder boring machine for boring six bores of cylin- der block (Blue- prints of cylinders)	7,500.00

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<u>Inquiry Number</u>	<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
TE 3703	6/20/39	Norton	3	#1 Tool and cutter grinders	\$3,300.00
TE 3727	6/28/39	Gogan Machine Co.		High production machine for making springs to be used in cars. (At present Kobe makes springs under hot states by means of lathes. Production is un- satisfactory)	
MF 2263	8/12/40	Shibaura- United		Piercing mill for non-ferrous tubes for Moji works. Kobe was negotiating with Meer Co. for mill but due to European conditions, negotiations ceased. Shibaura asked United Engineering Co. for a price on manufacturing prints and also quota- tion on basis of both companies making the machine.	
MF 3096	3/31/39	Giddings & Lewis	1	#780-F Horizontal boring machine	57,793.12
MF 3717	4/17/40	Gear Grinding Machine Co.	1	SG-12 Broach and spline grinding machine	12,250.00

3. Through Imperial Export Co.
(For the Toba Plant)

13570A	10/11/39	Monarch	1	14" x 18" Magno-matic lathe	3,493.80
14671	1/30/39	Potter & Johnston	3	#6A Rebuilt automatic chuck- ing machines	7,851.48

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<u>Inquiry Number</u>	<u>Date</u>	<u>Manufacturer</u>	<u>No.</u>	<u>Product</u>	<u>Price</u>
14672	1/30/39	Monarch	1	18" x 48" Model RR engine lathe	\$3,781.30
14673	2/4/39	Acme	1	#4R Universal turret lathe	4,214.00
14763	10/11/39	Globe Tool & Engineering Co.	1	Type NE-2 balancing machine	1,629.00

B. Discussion

1. Continuous Sheet & Tin Plate Mill

Kobe Steel's expansion plans began in 1935 when M.S.K. was asked to obtain quotations on a continuous sheet and tin plate mill to be built by American manufacturers and shipped to Japan. This mill was probably intended for one of the plants around Kobe. In the early part of 1936, Mitsubishi obtained the specifications and asked several American manufacturers to submit bids. Proposals were submitted by several American firms including Hesta, United Engineering, E. W. Bliss, Salem, Ohio, and Aetna Standard Engineering Co., Youngstown, Ohio, and Westinghouse Electric International, New York, N. Y. German makers, including Krupp and DeMag, were also approached.

The following memorandum contained in Inquiry No. 165 indicates the type of mill desired by Kobe Steel. The memorandum was written by Charles Muchnic, United Engineering, after an interview with Messrs. Asihara, Toshima and Yamagida, officials of the Kobe Works, and Messrs. Ota and Norton of the Mitsubishi Company, dated February 16, 1936:

1. Yearly minimum capacity 120,000 metric tons of sheets of which 60,000 tons for tin plate and 60,000 tons of hot rolled commercial sheets as thin as is practicable under 1 mm. if possible.

Maximum width of commercial and tin plate sheets 20".

2. Cold mill to have capacity for 60,000 tons per annum of sheets for tin plate thickness to be as follows:

0.35 m/c to 0.2 mm. equal to .0.0138" to 0.0079"
Capacity to be figured on operating of two shifts
of ten hours per day and 25 working days per
month.

Mills to be designed in metric measurements
generally and where English measurements are
used, metric equivalents are to be shown. All
threads Whitworth standard.

3. All piping in inches, U. S. standard threads,
English pipe threads preferred, if possible.
4. Preference is for using ingots cast either
square or 500 mm. x 180 mm. x 1 mm., weighing
700 K.

Would like to have United's recommendation of
the maximum size slab that could be used with-
out necessitating the installation of a blooming
mill and to make use of as few of the 4-high
stands as may be consistent.

The Kobe Steel Works has been producing for
years large tonnages of small ingots for their
own and other plants.

5. United recommendation of a list of all auxiliary
machinery that may be required.
6. Main electric supply 3300 volts, 60 cycles A.C.,
3 phase. For small motors under 100 H.P., 220
volts, 60 cycles A.C., 3 phase.
7. Water supply is scarce in Kobe. Desire United's
recommendation as to circulating water systems
to provide economic use of water in the operation
of continuous mill. Principal water supply is
from the City Water Works.

Would also like to have some information as to
the necessary consumption of steam and compressed
air in the operation of the mills.

Quotations were supplied by United Engineering Co. and Mesta Machine
Co.

On April 9, 1936, E. W. Bliss and Co., Salem, Ohio, submitted
their proposal to build a 12" x 30" x 24" four high five stand
tandem mill. M.S.K. Inquiry #165 contains the specifications of
this mill.

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On May 5, 1936, Aetna Standard Engineering Co., Youngstown, Ohio, submitted a quotation for pickling strip and coating tin plate. The equipment was to have a capacity of 5,000 tons per month. The strip pickling equipment was to handle plate 20" x 28" x 31" gauge. Inquiry #165 contains complete specifications of this equipment.

Other quotations include Westinghouse, Krupp, and DeMag. The German companies specifications, however, are not available.

2. Duralumin Rolling Mills

a. M.S.K. Inquiry #N.Y. 1625.

During Mr. Powell's stay at Moji in 1938, he was told by Mr. Machinaga and Mr. Toshima of Kobe Steel that the latter expected to adopt one of the following two proposals:

I.

- 2 sets - two high hot mills
- 2 sets - three high hot mills
- 2 sets - two high cold mills
- 2 sets - three high cold mills

or

II.

- 1 - three tandem four high mill

The customer seems to be inclined toward the second proposal.

Mesta submitted the following proposal:

Item 1.

- 1 - 40" x 90" Two high reversing hot mill
and equipment - c.i.f. Moji - \$258,700.00
- 1 - 38" x 70" Two high reversing hot mill
and equipment - c.i.f. Moji - \$244,900.00

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Item 2.

- 1 - 34" x 24" x 90" Three high hot mill
and equipment - c.i.f. Moji - \$178,850.00
- 1 - 32" x 22" x 70" Three high hot mill
and equipment - \$168,300.00

Item 3.

- 20 $\frac{1}{2}$ " x 49" x 46" Three stand tandem four
high cold mill and equipment - \$701,450.00

Item 4.

- 1 - 20 $\frac{1}{2}$ " x 49" x 84" Four high cold mill
and equipment - \$351,500.00

Item 5.

- 1 - Hydraulic roll balance accumulator with
pump and roll changing equipment for
four high cold mills - \$26,000.00

Item 6.

- 1 - 84" Shearing line - \$114,450.00

All prices C.I.F. Moji. Delivery 15 months after
receipt of order.

The hot mills were to roll cast dural ingots 150-200 mm.
thick by 500-800 mm. wide by 300-1000 mm. long down to 3.6 mm. thick.

The four high cold mills were to roll hot rolled dural
sheets 3-6 mm. thick down to 0.3 mm. to 1.2 mm. thick. The 20 $\frac{1}{2}$ " x
49" x 84" four high mill; in addition to skin passing and flattening
the product of the four high tandem mill, was to roll product up to
2000 mm. wide.

Annual production was to be 1800 kilotons of sheets
600 mm. to 1000 mm. wide by 0.3 mm. thick and 8400 kilotons of
sheets 1000 mm. wide by 0.6 mm. thick per year of 6,000 hours.

b. M.S.K. Inquiry #N. Y. 2283.

In September, 1939, Kobe Steel submitted the following inquiry through M.S.K. to Mesta for cold mills for rolling duraluminum. These mills were probably intended for the Moji and Chofu works:

- 2 - 28" x 13" x 48" Three high mills and equipment
- 2 - 28" x 48" Two high mills and equipment
- 1 - 20" x 39 3/4" x 32" Four high mills and equipment

The two and three high mills were to roll dural sheets 1 meter wide x 2 meters long x .3 mm. thick from material up to 10 mm. thick at a maximum speed of 180 ft. per minute.

The four high mill was to be arranged to roll dural sheets 3 mm. thick by 3.5 meters long from material up to 10 mm. thick. After reaching this thickness, the sheets were to be coiled in an up-coiler and rolling of the material was to be continued as strip down to .3 mm. thick.

Prices 1 - \$163,000.00
2 - 258,000.00
3 - 244,000.00

Total -- \$663,000.00

Specifications and motor lists are included in the file.

c. M.S.K. Inquiry #N. Y. 3040.

In April of 1940, Kobe Steel inquired of M. S. K. for a 2-high and a 3-high mill to roll light alloys in the hot state. The specified ingot size was 700 mm. x 1,000 mm. x 140 mm. This inquiry had at first been sent to Krupp in Germany as per Kobe Steel's preference. German delivery, however, was so doubtful as to dictate an inquiry in the United States.

d. M.S.K. Inquiry #N. Y. 3079.

In September of 1941, Kobe sought to equip its Chofu plant for the manufacture of super duralumin and dural clad super duralumin sheet and strip. Although Kobe realized that "under the present situation, it is hopeless to expect American machinery", the near impossibility of obtaining German machinery compelled reference to the United States. The specifications of the equipment desired are included in the appendix as Exhibit No. 2.

3. Presses

a. M.S.K. Inquiry #N. Y. 2400.

In April 1940, Kobe Steel inquired of Mesta for a piercing mill for work on steel as well as brass and other non-ferrous metals. Maximum weight of ingot was to be 700 kgs. and the product was to range in outside diameter from 40 to 225 mm. Thickness was to range from 5 to 50 mm. Length of the product was to be 4000 mm.

The mill was to be designed for making pipes from a minimum diameter of 1.5 to a maximum of 400 mm., thickness to range from .3 mm. to 25 mm.

The tubes coming from the piercing mill were to be sent to plug mills, reducing mills, and drawing machines to obtain the full range of sizes.

b. M.S.K. Inquiry #N. Y. 2532.

Kobe Steel had placed an order with the German company, Illies & Co. for a Die Forging Press made by Eumoco Co. They wanted the press to manufacture airplane cylinders, hubs, engine connecting rods, crankshafts and pistons of motor cars, cartridges of bullets and shells, and other forging parts.

The file contains specifications of the Eumoco 'Maxima' Forging Press.

Due to the outbreak of the European War, the Japanese feared delivery from Germany would be impossible, so they placed the inquiry for an American made press in October 1939.

The inquiry was placed with National Machinery Co., Tiffin, Ohio, who recommended a 6" High Duty Forging Machine.

The airplane cylinder to be worked on was 196 mm. across the flange, 178 mm. outside diameter and 125 mm. hole. Overall length was 250 mm. Under average heating and handling facilities, National 6" High Duty Forging Machine was expected to produce 50 to 60 cylinders per hour.

c. M.S.K. Inquiry #N. Y. 2666.

In March 1940, Kobe Steel asked Mesta for a 10,000 ton forging press for its Nagoya plant. The press, apparently, had previously been ordered from Hydraulik, A.G., of Germany for \$1,437,457.50.--(See M.S.K. Confidential Report for 1st half of November 1938), but no German delivery could be expected.

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4. Blooming Mill - M.S.K. Inquiry #N. Y. 2665.

In March of 1940, the Tokyo office of M.S.K. said that Kobe Steel intended to reorganize one of its plants. The file does not disclose which plant was referred to. The plan was to move to a more spacious site. The open hearth furnaces, merchant bar mills and wire rod mills were to be moved and a new blooming mill and a structural mill for large and medium sections were to be built.

No definite details of the new plant had been decided on, but it was their intention to produce 400,000 tons annually of angles, channels and I sections. This is based on a production of 500,000 tons a year. It was possible that the plans might not materialize for three or four years. M.S.K. suggested that Mesta submit plans to Kobe Steel Works.

V. Question of Success of
Kobe Steel Expansion Plans

As frequently indicated above, the Japanese trading company files permit no definite determination of Kobe Steel's success or failure in the execution of its plans.

Some indication that the plans are behind schedule, however, is given by mail intercepted by the allied blockade. As late as November 1942, Kobe Steel was still inquiring for German equipment. Kobe sought a special warm sheet rolling mill, a two-high reversing mill of 300,000 tons annual capacity, a blooming mill, a billet mill, and a wire bar rolling mill for manufacture of nickel chromium piano wire to be used in production of springs and needle bearings.

KOBE SEIKOSHO K.K.

(Kobe Steel Works)

APPENDIX

Exhibit No. 1 - - - Specifications of single stand 80"
four-high cold mill for cold rolling
super-duralumin.

Exhibit No. 2 - - - Specifications of equipment for
producing super-duralumin and dural
clad super-duralumin sheet and strip
for aircraft use.

Exhibit No. 1

PROPOSAL AND SPECIFICATIONS

FROM

MESTA MACHINE COMPANY

Pittsburgh, Pa.

FOR

ONE (1) SINGLE STAND 80" FOUR-HIGH COLD MILL
FOR COLD ROLLING SUPER-DURALUMIN, WITH
AUXILIARY EQUIPMENT AND SPARE PARTS.

To: Mitsubishi Shoji Kaisha, Ltd. (Kobe Steel Works) New York, N.Y.

We propose to furnish, subject to the conditions of our standard contract, One (1) Four-High Cold Mill with Auxiliary Equipment and Spare Parts.

Four-High Cold Mill will consist of the following:

One (1) 20 1/2" x 49" x 80" Four-High Cold Mill including Two (2) Forged Hardened Steel Working Rolls; Two (2) Special Alloy Cast Steel Heat-Treated Backing-Up Rolls; Universal Mill Spindles; Spindle Carriers; Shoe Plates; Guides and Strippers; Deflecting Rollers; Bottom Roll Aligners; Roller Bearings for the Working Rolls; Mesta Oil Bearings for the Backing-Up Rolls; Roll Balance Pump and Accumulator; Electro-limit Gauging Equipment; Strain Gauge Type Roll Pressure Indicating System; One (1) Combination Gear Drive and Pinion Stand; Roll Changing Equipment; One (1) Mesta Patented Feed Reel; One (1) Tension Reel with Collapsible Block and Elevating Type Stripper; One (1) Sheet Charger; One (1) Leveller Table; One (1) Backed-Up Leveller; One (1) Piler with Table; One (1) Three-Roll Up-Coiler; One (1) Oil Lubricating System for Oil Bearings; One (1) Oil Lubricating System for Gear Drive and Pinion Stand; and One (1) Grease System for Mill.

Auxiliary Equipment will consist of the following:

One (1) Trimmer and Slitter for Sheets including Trimmer Knives and Two (2) Slitter Heads with Knives; Drawings only for sheet handling equipment at entry and delivery sides of Trimmer; Drawings only for Soda Bath Heat Treating and Washer; and One (1) Mesta Roll Grinder.

Spare Parts will consist of the following:

Four (4) 20 $\frac{1}{2}$ " x 80" Forged Hardened Steel Working Rolls
Four (4) Chucks for Working Rolls
Four (4) Roller Bearings for Working Rolls
Two (2) Universal Half Couplings for Working Roll Ends
One (1) 49" x 80" Heat-Treated Special Alloy Cast Steel Backing-Up Rolls
Two (2) Mesta Oil Bearings for Backing-Up Roll Necks
One (1) Roller Thrust Bearing for Backing-Up Roll
One (1) Bronze Worm Wheel Rim and Two (2) Forged Steel Worms for Screwdown

This equipment will be suitable for rolling super-duralumin having the following characteristics:

Hardness - Shore

Minimum - 10 before rolling; 21 after rolling
Maximum - 17 before rolling; 35 after rolling

Elongation

Minimum - 20 before rolling; 3 after rolling
Maximum - 50 before rolling; 25 after rolling

Tensile Strength

Minimum - 20 Kg. per square mm. before rolling
32 Kg. per square mm. after rolling

Maximum - 37 Kg. per square mm. before rolling
53 Kg. per square mm. after rolling

The equipment will be arranged to roll the duralumin in sheet form until it is reduced to approximately 3.0 millimeters thick, after which it will be coiled in the three-roll Up-coiler and will be further reduced, in coil form, to approximately 1.6 millimeters thick. From approximately 1.6 millimeters to .3 millimeters the coils will be reduced under tension.

SUPPLEMENT TO SPECIFICATIONS

FOR

80" COLD MILL AND EQUIPMENT

To: Mitsubishi Shoji Kaisha, Ltd. (Kobe Steel Works) New York, N.Y.

ONE (1) COLD MILL AND EQUIPMENT

One (1) 20 $\frac{1}{2}$ "&49"x80"
Four-High Cold Mill

Roll Housings - closed type - cast steel
Backing-Up Rolls - 49" diameter by 80" body-
Mesta heat-treated special alloy cast steel
Roll Neck Bearings for Backing-Up Rolls - of
Mesta Oil Bearing Type
Working Rolls - 20-1/2" diameter by 80" body-
forged steel, hardened
Roll Neck Bearings for Working Rolls -
roller bearings of approved type
Housing Shoes - cast iron of heavy section
Housing Screws - 18" diameter, forged steel,
.50-.60 carbon
Housing Screw Nuts - High grade aluminum
bronze
Screwdown - Combination spur and worm type
driven by two motors with magnetic clutch
for engaging either or both housing screws
Balance for Top Roll - Hydraulic
Indicator - Dial type with two hands to
indicate the relative adjustment of the
two screws; also two large dial indicators
to indicate large adjustments
Mill Spindles - Mesta Patented Universal
Type
Strippers and Guides will be furnished
Platforms and Railing will be furnished
Roll Balance Pump and Accumulator will be
furnished
Roll Coolant and Roll Cooling Systems will
not be furnished
Combination Gear Drive and Pinion Housing -
single reduction, single helical cut
teeth, roller bearing equipped; motor
pinion forged steel carburized and hard-
ened.
Mill Pinions - 20" pitch diameter, 32" face,
helical cut teeth, forged steel; carburized
and hardened.
Roll Changing Equipment will be furnished

One (1) Electro-Limit Gauge Equipment	Will gauge strip while the mill is in operation Electrical equipment is included
One (1) Roll Pressure Indicating System	Roll Pressure Indicating System of the strain gauge type will be furnished with necessary electrical equipment
Lubricating Systems	Two (2) Oil Lubricating Systems, one (1) for the gear and pinion teeth and one (1) for the backing-up roll neck bearings will be furnished One (1) System for grease lubrication will be furnished. This system will be automatic for the working roll bearings and semi-automatic for the other points of grease lubrication. Motors and controls for these systems will be furnished by Purchaser
One (1) 80" Mesta Patented Feed Reel designed for Regenerative Braking	Designed for a drag generator on each head and motor operated adjustments Cone Hubs - cast steel expanding type Vertical Adjustment - through a worm and worm wheel reducing set. Forged steel worm and bronze wheel Horizontal Adjustment - through motor driven twin screws and spur gears Screws - forged steel Gears will be forged steel
One (1) 80" Tension Reel	Self-contained unit equipped with anti-friction bearings Coil Drum - 28" diameter expanded Will be of the segmental type with motor operated grip and release Gear Drive - Single reduction, helical cut teeth, equipped with anti-friction bearings. Motor pinion forged steel, carburized and hardened. Gears will be enclosed in oil tight case Pneumatic stripper will be provided Elevator to lift and to support coil while it is being ejected, will be furnished
One (1) 80" Sheet Charger	An electrically assisted manually-operated Charger equipped with a motor driven belt table will be furnished for feeding the sheets rapidly, one at a time into the mill

One (1) Table
From Mill to
Leveller

Table will be of the belt type, motor driven
When the mill is rolling strip, this table
will be removed to allow access to the
Tension Reel.

One (1) 80"
Backed-Up
Leveller

Seventeen rollers - 4 1/2" diameter
Rollers of steel, special heat treatment,
95-100 scleroscope, ground
Bottom Rollers - stationary
Top Rollers - mounted in adjustable frame
Rollers driven through universal spindles
and enclosed drive
Roller bearing equipped

One (1) Piler
and Gravity
Table

Manually operated. Designed for piling
sheets behind the 80" mill
Table - 40'-0" long, gravity roller type

One (1) Three-
Roll Up-Coiler

Two (2) Pinch Rolls, and Three (3) Bending
Rolls 7.33" diameter by 80" body
Rolls of steel, special heat treatment,
95-100 scleroscope, ground
Coil Supporting Rollers will be fibre
covered shafts
Pinch Rolls - spring loaded - top roll
adjustable
Top Bending Roll and Coil Supporting Rolls
will have motor operated adjustments
Gear Drive - spur and worm drive - gears
hardened and cut teeth
Roller bearing equipped throughout
Designed to coil strip up to 75" wide

AUXILIARY EQUIPMENT

One (1) Trimmer
and Slitter
for Sheets.

Knives - 16-1/2" diameter - tool steel,
mounted on the ends of arbors carried in
roller bearings

Arbors will be carried in the eccentric
bores of massive cylindrical casings.
Pairs of casing will be geared together
and meshed with a worm by means of which
the knives may be adjusted for the de-
sired opening between them.

The two housings carrying the pairs of
cutters will be adjustable about the
centerline of the machine by right and
left hand screws

Two (2) Pinch Rolls on entering side 5-3/4"
diameter by 84" long, hardened and
ground

Rotary Scrap Cutter extends across the face
of the machine

Trimmer Heads, Pinch Rolls and Scrap Cutter of each Trimmer will be driven by single, totally enclosed drive through flexible couplings

Machine equipped with anti-friction bearings throughout

In addition to the trimming heads, one pair of slitting heads will be furnished. The arbors will be designed to make possible cutting to any width without removing the heads from the arbors

Sheet Handling Equipment

For Sheet Handling Equipment at entry and delivery side of Trimmer, drawings only will be furnished

One (1) 24"x14'-0" Mesta Roll Grinder

Designed to handle the Working Rolls of the Four-High Cold Mill

All electrical equipment will be furnished. Work Bed will be of heavy cast iron box section design with one flat way and one inverted "V", force feed lubricated

Work Table will be of heavy cast iron box section design with inclined ways for alignment of the headstock, tailstock, and roll neck bearings. Table Drive will be through a hardened worm and forged steel rack

Headstock will be of cast iron and welded steel construction

Spindle will be forged steel, hollow bored, and set rigid in the headstock

Headstock Drive will consist of "V" belts from a variable speed motor giving instant speed control from the operator's stand. Tailstock will be of cast iron, two piece construction, arranged for hand operated traverse

The Wheel-Head will be of special design having the driving motor armature mounted directly on the wheel spindle. The spindle will be hardened and ground forged alloy steel

Cambering attachment will be provided

Cooling water will be supplied from a centrifugal pump

Electrical wiring will be complete in concealed conduits

Face Plate Speed - 13 to 52 R.P.M.

Grinding Wheel Diameter - 30"

Wheel Speed - 515 to 1030 R.P.M.

Auxiliary Equipment included with the Grinder will be as follows:

Headstock - Multiple "V" belt drive
Tailstock - Manually operated traverse
Wheel Head with motor armature mounted directly on spindle
One (1) Set of two (2) Work Centers
One (1) Set of two (2) Roll Neck Bearing Stands with blocks for the Working Rolls of the Four-High Cold Mill
One (1) 30" Grinding Wheel
One (1) Grinding Wheel Center
One (1) Wheel Truing Fixture
One (1) Mounted Diamond
One (1) Set of Water Guards
One (1) Set Wrenches
One (1) Wheel Balancing Arbor and Stand
One (1) Roll Driving Dog
One (1) Coolant Pump
One (1) Oil Pump
One (1) Wheel Changing Arm

Electrical Equipment included with the Grinder will be as follows:

Wheel and Headstock Motors and all control Equipment are special. Therefore, all electrical equipment will be furnished by the Mesta Machine Company
One (1) Wheel Motor - 40 H.P., 515/1030 RPM, semi-enclosed, 220 Volt, D.C.
One (1) Headstock Motor - 10 H. P., 250/1000 RPM, semi-enclosed, 220 Volt, D.C.
One (1) Traverse Motor - 5 H.P., 450/1800 RPM, semi-enclosed, 220 Volt, D.C.
One (1) Cross-Feed Motor - 2 H.P., 850 RPM, semi-enclosed, 220 Volt, D.C.
One (1) Pump Motor - 1 H.P., 1780 RPM, semi-enclosed, 220 Volt, D.C.
One (1) Control Panel, complete with heavy duty mill type controls
One (1) Rheostat Panel complete
One (1) Pendant Switch complete

COLD ROUGHING SCHEDULE

for

DURALUMIN

KOBE STEEL WORKS - JAPAN

PASS NUMBER	THICKNESS & WIDTH (INCHES)	REDUCTION PERCENTAGE	LENGTH (FEET)	SPEED (FT. PER MIN)
0	.236 x 75 Annealed	-	12.14	-
1	.202	14.4	14.2	200
2	.170	15.8	16.9	250
3	.140	17.6	20.4	275
4	.115	17.8	24.9	300
5	.096	16.6	28.1	325
6	.083	13.5	34.5	350
7	.070	15.6	41.0	350
8	.062 x 75	11.4	46.2	350

Passes 4 to 8 delivery to Upcoiler. Anneal after pass #8.

Strain Gauge Mechanism will be set to blow siren when spreading force between rolls exceeds 3,500,000# for two necks.

All passes should be rolled without exceeding full load amperage.

1-14-1938.

COLD FINISHING SCHEDULE

for

DURALUMIN

KOBE STEEL WORKS - JAPAN

PASS NUMBER	THICKNESS & WIDTH (INCHES)	REDUCTION PERCENTAGE	LENGTH (FEET)	SPEED (FT. PER MIN)
0	.062 x 75 Annealed	-	46.2	-
1	.044	29	65.	350
2	.032	27	88.4	350
3	.023	26	122.	350
4	.019	19	151.	350
5	.0155	18.5	185.	350
6	.013	14	215.	350
7	.012	10	239.	350

ANNEALING and Heat Treatment for the above schedule depends on properties desired. All passes under tension.

Strain Gauge Mechanism will be set to blow siren when spreading force between rolls exceeds 3,500,000# for two necks.

All passes to be rolled without exceeding full load amperage.

1-14-1938.

Material to be rolled will be super-duralumin, having the following characteristics:

Hardness - Shore

Minimum - 10 before rolling; 21 after rolling
Maximum - 17 before rolling; 35 after rolling

Elongation

Minimum - 20 before rolling; 3 after rolling
Maximum - 50 before rolling; 25 after rolling

Tensile Strength

Minimum - 20 kg. per square mm. before rolling
32 kg. per square mm. after rolling
Maximum - 37 kg. per square mm. before rolling
53 kg. per square mm. after rolling

Sheets to be rolled will be from 1 to 2 meters long, 6 mm. thick, and 1900 mm. wide to be rolled into coils .3 mm. thick. The equipment will be arranged to roll the duralumin in sheet form until it is reduced sufficiently to be coiled, after which it will be rolled under tension.

SUPPLEMENT TO SPECIFICATIONS

FOR

ONE (1) SINGLE STAND FOUR-HIGH 80" COLD MILL
AND EQUIPMENT.

One (1) 20"x49"x80" Four-High Cold Mill	Roll Housings - closed type - cast steel Backing-up Rolls - 49" diameter - Mesta heat treated special alloy steel Roll Neck Bearings for Backing-up Rolls - Mesta Oil Bearing Type Working Rolls - 20" diameter by 80" body - forged steel, hardened Roll Neck Bearings for Working Rolls - roller bearings of approved type Housing Shoes - cast iron of heavy section Housing Screws - 18" dia. forged steel, .50-.60 carbon Housing Screw Nuts - High grade aluminum bronze
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Screwdown - Combination spur and worm type driven by two motors with magnetic clutch for engaging either or both housing screws

Balance for top Roll - Hydraulic

Indicator - Dial type with two hands to indicate the relative adjustment of the two screws; also two large dial indicators to indicate large adjustments

Mill Spindles - Mesta Patented Universal Type Strippers and Guides will be furnished

Platforms and Railing will be furnished

Roll Balance Pump and Accumulator will be furnished

Roll Coolant and Roll Cooling Systems will not be furnished

Combination Gear Drive and Pinion Housing - single reduction, single helical cut teeth, roller bearing equipped, motor pinions forged steel carburized and hardened

Mill Pinions - 20" pitch diameter, helical cut teeth, forged steel, carburized and hardened

Roll Changing Equipment will be furnished

One (1) Electro-Limit Gauge Equipment,

Will gauge strip while the mill is in operation. Electrical equipment is included

One (1) Roll Pressure Indicating System

Roll Pressure Indicating System of the strain gauge type will be furnished

Lubrication Systems

Two (2) Oil Lubricating Systems, one (1) for the gear and pinion teeth and one (1) for the backing-up roll neck bearings will be furnished

One (1) System for grease lubrication will be furnished. This system will be automatic for the working roll bearings and semi-automatic for the other points of grease lubrication

Motors and controls for these systems will be furnished by Purchaser

One (1) 80" Mesta Patented Feed Reel Designed for Regenerative Braking

Designed for a drag generator on each head and motor operated adjustments

Cone Hubs - cast steel expanding type

Vertical Adjustment - through a worm and worm wheel reducing set. Forged steel worm and bronze wheel

Horizontal Adjustment - through motor driven twin screws and spur gears

Screws - forged steel

Gears will be forged steel

One (1) 80"
Tension Reel

Self-contained unit equipped with anti-friction bearings
Coil Drum - 28" diameter expanded. Will be of the segmental type with motor operated grip and release
Gear Drive - Single reduction, helical cut teeth, equipped with anti-friction bearings. Motor pinion forged steel, carburized and hardened. Gears will be enclosed in oil tight case
Pneumatic stripper will be provided
Elevator to lift and to support coil while it is being ejected, will be furnished

One (1) 80"
Sheet Charger

An electrically assisted manually-operated charger equipped with a motor driven belt table will be furnished for feeding the sheets rapidly, one at a time into the mill

One (1) Table
From Mill to
Leveller

Table will be of the belt type, motor driven
When the mill is rolling strip, this table will be removed to allow access to the Tension Reel

One (1) 80"
Backed-Up
Leveller

Seventeen rollers - 3-1/2" diameter
Rollers of steel, special heat treatment, 95-100 scleroscope, ground
Bottom Rollers - stationary
Top Rollers - mounted in adjustable frame
Rollers driven through universal spindles and enclosed drive
Roller bearing equipped

One (1) Piler and
Gravity Table

Manually operated. Designed for piling sheets behind the 80" mill
Table - 60'-0" long. gravity roller type

Complete specifications will be furnished for all electrical equipment, including methods of control, but no electrical equipment is included in this proposal except strain gauges and electro-limit gauges for the mill.

No Piping; floor plates; or foundation bolts and washers will be furnished.

In the design of the equipment, particular attention will be given to lubrication methods. All gears will be fully enclosed, and will be designed, wherever possible, for dip and splash lubrication.

Foundation drawings and general layouts will be furnished as a guide for the proper installation of the equipment.

All of this equipment will be of the most modern type as developed by recent experience.

MOTOR LIST - ONE (1) 20"x49"x80" FOUR-HIGH COLD-MILL & EQUIPMENT

SHEET #1

mitsubishi shoji kaisha, LTD., - KOBE STEEL WORKS - NEW YORK, N.Y.

11-11-37

ITEM	APPLICATION	MOTOR DATA						CONTROL DATA				LIMIT SWITCHES NO. & TYPE	
		NO. REQD.	H.P.	RPM	TYPE	VOLT-AGE	CURR-ENT.	WIND-ING.	:DYN. :BRAK.	MOTOR BRAKES	SH. SER.		REVERS-ING.
A	4-Hi. Cold Mill Main Motor	1	1500	<u>300</u> 600		600	D.C.	Shunt	—	—	—	—	—
A-1	Screwdowns	2	35	575	Mill Type	220	D.C.	Comp.	Yes	—	—	Yes	—
A-2	Mag. Clutches	1	20" Diameter - Magnetic Clutch										
B	RGB Feed Reel	2	15	800	Mill Type	220	D.C.	Comp.	Yes	—	—	Yes	2-Hatchway
B-1	Generator	2	$\frac{7\frac{1}{2}}{10}$	$\frac{600}{2400}$	Gear Unit	220	D.C.	Special Control for Regenerative Braking					
C	Tension Reel	1	$\frac{150}{225}$	225 450 900	Ind'l.	600	D.C.	Shunt	Yes	1-18"	Sh.	Special with M.G. Set	1-Cam
C-1	Tension Reel Wedge Drive	1	4	1150	Ind'l.	220	D.C.	Comp.	Yes	1-6" no Wheel	Ser.	Yes	1-Hatchway
D	Sheet charger Tilt Drive	1	15	725	Mill Type	220	D.C.	Comp.	Yes	1-14"	Ser.	Yes	1-Cam
D-1	Sheet Charger Belt Drive	1	5	$\frac{450}{1800}$	Gear Unit 10:1 R.	220	D.C.	Shunt	No	—	—	No	—
E	Leveller Table	1	5	$\frac{450}{1800}$	Gear Unit 10:1 R.	220	D.C.	Shunt	Yes	—	—	No	—
F	Leveller	1	$\frac{60}{75}$	$\frac{400}{1200}$	Ind'l.	220	D.C.	Shunt	Yes	—	—	Yes	—

ITEM	APPLICATION	MOTOR DATA					CONTROL DATA				LIMIT SWITCHES		
		NO. REQD.	H.P.	RPM	TYPE	VOLT-AGE	CURR-ENT.	WIND-ING.	:DYN. BRAK.	MOTOR BRAKES	SH. SER.	REVERS ING.	NO. & TYPE
G	Roll Balance	1	10	750	Ind.	220	A.C.	3-phase 50-cycle	No			No	2-Hatchway

One (1) 1200 K.W. Motor Generator Set required for Mill and Reels.

Exhibit No. 2

MITSUBISHI SHOJI KAISHA, LTD.

TOKYO

No. Ki-S-3348

Tokyo,

September 26th, 1941

The Manager

Mitsubishi Shoji Kaisha, Ltd.,

NEW YORK.

Dear Sir,

Re: Super duralumin and dural clad
super duralumin strip and sheet
for Kobe Seikosho (Enq.No.371)

Kobe Steel Works are interested in the establishment of new plant for manufacture of sheet and strip of super duralumin and dural clad super duralumin in their Chofu plant, particulars of which as per given in the specification 30-5-41 attached.

Although, under the present situation, it is quite hopeless to expect American machinery Kobe Steel Works who have Mesta rolling mill and know superiority of Mesta in this line are still favouring Mesta, and have expressed their wishes to have Mesta's quotation on this mill if such a chance would happen in near future that some remarkable improvements are made on the present unfavourable relation of two nations between Japan and United States.

This is our intention to send you this specification and hope you to keep it on your side for future purposes without get in contact with Mesta so far the condition continues.

Wishing the future development of this business,

We are,

Yours faithfully,

MITSUBISHI SHOJI KAISHA, LTD.

Copy: Moji
Osaka

S P E C I F I C A T I O N

30th May, 1941.

Machinery and equipments for producing super-duralumin & dural clad super duralumin sheet & strip for air craft use

1) Material:

Starting material coming into consideration is ingot for super-duralumin sheet and dural clad sheet for air craft use.

Size of the ingots:-

thickness	- 80 mm
length	- 600 mm
width	- 500 mm
weight	about 65 kgs.

Dural clad sheet will be manufactured in two ways i.e. one start from the ingot cast in duplex from the beginning, while in another way different material is doubled during the hot rolling process.

2) Products:

Super-duralumin sheet and dural clad sheet with following dimensions

thickness	0.3 - 2.0 mm
width	600 mm
length	over 10 meters - 30 m.

3) Output:

150 tons a month of 25 days and 20 working hours a day. based on dural clad sheet of 10 meters long, 0.6 mm average thickness and 600 mm finished width.

4) Working process or machinery required:

Removing defective surface of starting material (in case of super duralumin only, for dural clad sheet this process is eliminated) - Electric reheating furnace - Reversing two-high hot mill (the ingot will be rolled down to 5mm. thick in hot rolling) - Electric annealing furnace - Pickling and cleaning - Reversing two-high or four-high cold roughing mill - Intermediate electric annealing furnace - Reversing two-high cold finishing mill (to be used also as skin pass for coil) - Salt bath (electric furnace) - skin pass mill (for sheet) - straightning & shearing machines (All process after hot finish carried on in coil form),

Besides the above mentioned machinery and equipments various transfer and conveying equipment to transmit the material from one process to other are requested. (Total layout drawings showing the arrangement of all equipments shall also be furnished)

5) Roll grinder:

This is for regrinding the surface of all kinds of roll, in question.

Furthermore, you are requested to pay special attention to comply with the customer's requirements.

- 1) Mesta is requested to work out the layout of the whole plant which they consider to be the best. The sufficient space is reserved for this plant.
 - 2) Dimensions of building, length width, and height of crane way, and capacity of respective crane to be prepared in that building are to be informed.
 - 3) Regarding barrel length of the roll the customer's idea is likely to be from 800 mm to 900 mm. If there is any standard size to suit this purpose, please recommend same. Shorter barrel length which is satisfactory and enough is to be considered.
 - 4) A complete set of spare parts is also to be offered.
 - 5) All furnaces are to be of electric heating.
 - 6) Mesta is requested to quote the whole machinery required for this plant, however, from the above simple part will be procured in Japan according to the drawings and informations to be received from Mesta. For these parts separate price and the corresponding drawing fee are to be informed respectively.
- 6) All electrical equipment will be prepared in Japan according to the specification to be supplied by machine contractors. Motor specification indicating horse-power, revolution speed, rating and method of control should be furnished in the earliest manner.

Electric source available is

A.C. 3 phase 3300 Volts, 60 cycle
and " " 220 Volts, 60 cycle

In case D.C. is necessary its source will also be prepared in Japan, however, all data on D.C. motor as well as generator are to be given in the motor specification.