ELECTRICAL RECEIVING AND DISTRIBUTING EQUIPMENT FOR FIRST PERIOD FOR USIMINAS, BRAZIL

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I. PREFACE

This equipment has been manufactured for USIMIMAS (Usinas Siderurgicas De Minas Gerais S.A.), Brazil which was established in co-operation with Japan and Brazil, and forms a trunk receiving and distributing system of all electric power sources at blast furnaces, rolling mills and so forth.

The equipment consists of one 154 kV 60 c/s receiving circuit, three banks of on-load tap changing main transformer, step down, 154/66 kV, 30 MVA, three phase, and a lot of secondary substations radially distributed, including the electric rooms near by the loads stepped down to 11.5 kV and 3.45 kV.

The total nine substations electric rooms are respectively equipped with modernized supervisory control equipment to concentrate operations, controls, indications etc. in order to make rational distribution of power and also to minimize maintenance cost.

Furthermore, three Diesel generators 1,250 kW (two sets in blast furnance transformer room and one set in converter electric room) are arranged and compose local loop circuits to accommodate power in an emergency (see *Fig. 1*).

Machine foundations are now under construction in Brazil, the southern hemisphere, farthest from Japan, and Brazilian themselves install, assemble and operate the equipment, so that we planned and designed the most practical and standardized type equipment based on our Company's long experience.

Our Company exported similar kinds of plant as 30 MVA synchronous condenser set for Burma, the electrical equipment for natural gas fertilizer factory for Pakistan etc. and now we have completed this receiving and distributing equipment in succession.

Taking advantage of this opportunity we here introduce about the special features of this equipment as well as the outline of USIMINAS and the specifications of the equipment.

II. INTRODUCTION OF USIMINAS

At first we introduce an outline of this works.

It is said that the construction of this works is one of the largest enterprises to which the private companies of Japan have given support in foreign countries throughout a period before and after the second world war.

The Brazilian term "USIMINAS" is an abbreviation of Usinas Siderurgicas de Minas Gerais S.A.

The movement for establishment of USIMINAS started in 1956 and it was in 1957 that Nippon Usiminas Co., Ltd. was established according to the formal conclusion of Japanese capital investment to USIMINAS.

Nippon Usiminas Co., Ltd. which is voluntarily contributed by fourteen representative companies; seven steel companies, i.e. Yawata Iron & Steel Co., Ltd., Fuji Iron & Steel Co., Ltd., Nippon Kokan K.K. etc. and seven machinery makers including our Company is shared 40% of total capital of USIMINAS and it's aim is to attain the capital participation,

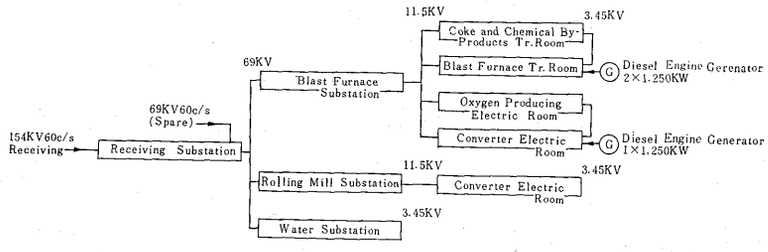


Fig. 1 System diagram of electrical distribution

supply the machines and equipment, construct the plant, and offer the technical co-operation to management and the various businesses relating to them.

The work is named as Intendente Camara Works and the plant site situated in Ipatinga village, the northeast part in the State of Minas Gerais, Brazil which lies about 450 km far from Vitoria, the port city faced on the Atlantic Ocean, by Vitoria-Minas Railway (see *Fig. 2*).

In spite of several weak points, i.e. one meter narrow gauge, single line etc., the railway is now the only principal way and the greater part of equipments for USIMINAS being landed on Vitoria, is brought to the Intendente Camara Works by this way. It being inevitable for the steel production of USIMINAS to import the coke and coal from North-America, the increase of transportation capacity is being planned by means of the improvement of many transportating lines including this railway.

As to area, the state of Minas Gerais amounts to 1.6 times as wide as Japan and the semi-tropical climate is well to live (see *Table 1*).

The other hand, she is rich in mineral resources and iron-ore, manganate, gold, diamond, etc, have been abundantly digged out or found.

Especially, this district reserves the presumed 15 billion tons of iron-ore which is supposed a half of iron ore all over Brazil and the naked hematite

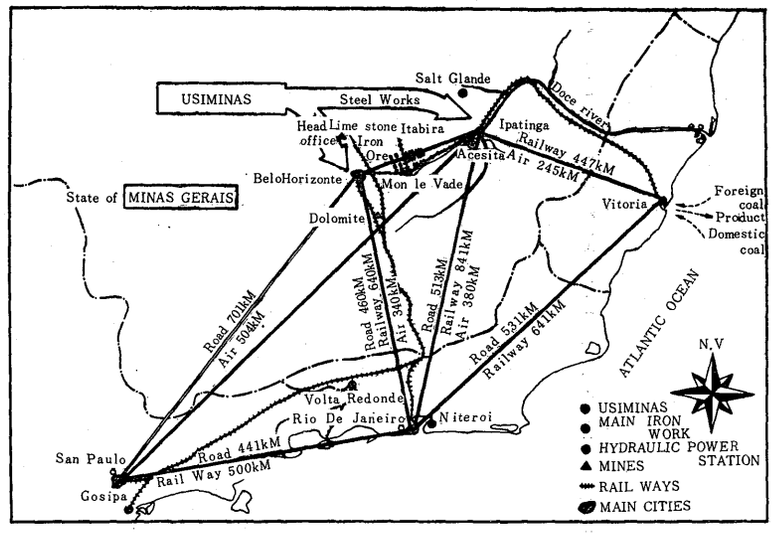


Fig. 2 Circumference of Ipatinga

Table 1 **Meteorological conditions of Villa Ipatinga**

a. Rainy season	From December to February
b. Atmospheric temperature	
Annual average	23.7°C (period covering 1955~1957)
Positive maximum	36.5°C (the highest during three years was 17 th Jan. 1956)
Positive lowest	4°C (the lowest during three years was 22 nd July 1957)
c. Relative humidity	Average 72.2%
Manipulated maximum average	85.1% (in March and May, 1956)
d. Rain fall	
Total rainfall per year	1,697.7 mm
Daily maximum	100.1 mm
Average rainfall per day	4.3 mm
During rainy season	9.1 mm
During dry season	1.1 mm
e. Wind	Usually westward wind average 1.7 m/sec
f. Earthquake	No apprehension at the Plant site

Note. The abovementioned data are quoted from "Bulletin of Posto de Meteorologia de Acesita Years: 1955, 1956 and 1957".

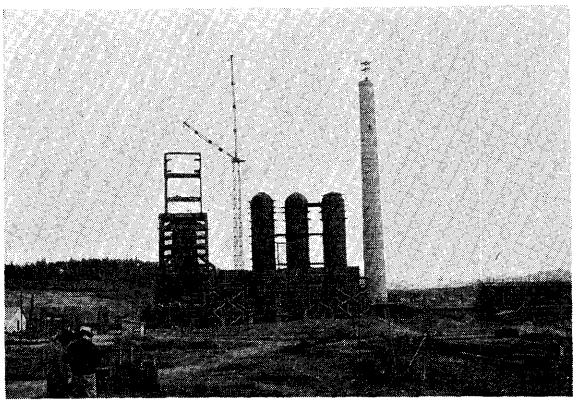


Fig. 3 Blast furnaces under construction

including 80% purity iron is exposed on the surface of the ground. By this reason the plant is favorably located in Ipatinga village. Now at the plant site, two blast furnaces are under construction by Ishikawajima-Harima Heavy Industries Co. and other fundamental public works are going on smoothly (see *Fig. 3*).

A lot of machines and equipments amounting to 35 billion yen will be exported from Japan until 1965 in which the work will be finished.

Thus, at Ipatinga village, a frontier of the Minas Gerais until now, the " Pig iron to strip " modernized works will appear and produce under mass production system pig iron (500 thousand tons per year), steel (500 thousand tons per year) and chemical by-products (six thousand tons ammonium sulfate per year and five thousand tons benzol per year) etc. in spacious land of about 12×10^6 m^2.

This production amounts to over 20% of total output of Brazil, 2.3 million tons in 1960.

Table 2 **Expectation outputs of main iron works in Brazil (1965)**

Volta Redonda	1,250 (unit : 1,000 t/year)
Belgo Mineira	550
MINERASIL	350
Mannesmann	300
ACESITA	240
Aliperti	140
USIMINAS	500
COSIPA	500
VITORIA	250

This plan is based on the strong industrialization slogan of "fifty years' progress in five years" and the plant occupies the third place following Volta Redonda and Belgo Mineira (see *Table 2*).

And the Brazilian are also very volitional, because USIMINAS is the first case of construction of iron works under the co-operation of Japan and Brazil.

By the way, Brazilia, the new capital of Brazil, was set up in the state of Goyas, adjacent to and north west from the state of Minas Gerais.

III. SUMMARY OF THE EQUIPMENT

This is the electrical receiving and distributing equipment for all the power sources in the Intendente Camara Works which produce 500 thousand tons pig iron per year.

The apparatus are installed dispersely in nine places including the 154 kV receiving substation (see *Fig. 4*) and the other substation near by the

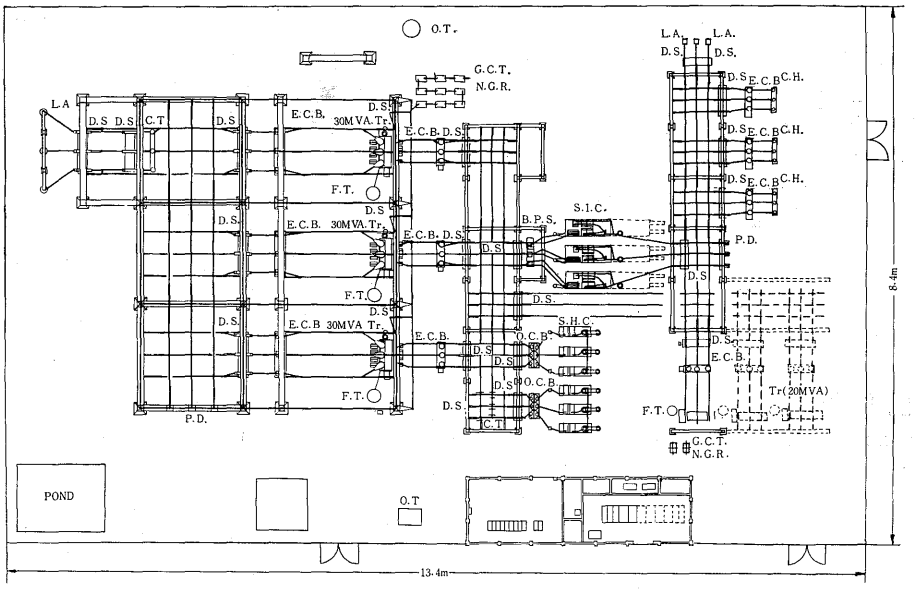


Fig. 4 Layout of receiving S.S. including rolling mill S.S.

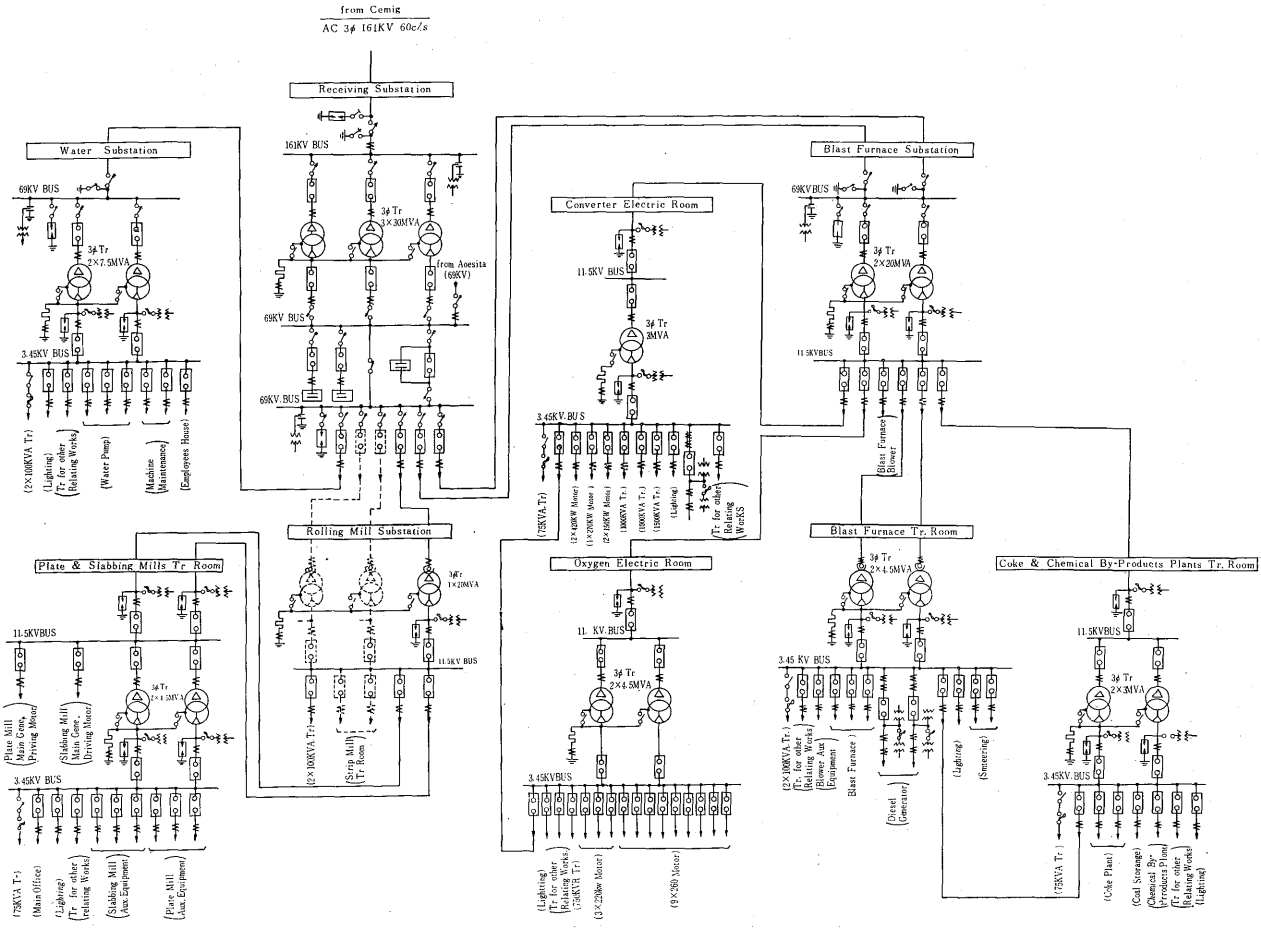


Fig. 5 Skeleton diagram of system

loads stepped down to 11.5 kV or 3.45 kV (see *Fig. 5*).

Against the undesirable geographical condition, opposite side of Japan, they were designed in common type which have been working for long time in Japan.

So we shall not here introduce the details, but only about the principal technical particulars of each apparatus and their quantities.

1. Power Transformers

(1) 30,000 kVA 154/66 kV 3 sets (see *Fig. 6*)
Special accessories : Yansen type on-load tap changing equipment.
Impedance : 11.75% at 30,000 kVA base.
Total weight : 140 tons (transport weight : 96 tons)

(2) 20,000 kVA 66/11.5 kV 3 sets (see *Fig. 7*)
Impedance : 7.16% at 20,000 kVA base.
Total weight : 51.2 tons (transport weight : 39.7 tons).

(3) 7,500 kVA 66/3.45 kV 2 sets
Impedance : 7.40% at 7,500 kVA base.
Total weight : 29.1 tons (transport weight : 22.2 tons)

(4) 4,500 kVA 11/3.45 kV 6 sets

(5) 3,000 kVA 11/3.45 kV 3 sets

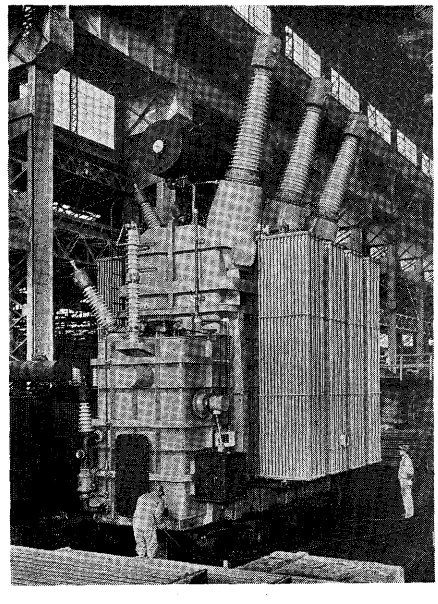


Fig. 6 30 MVA transformer

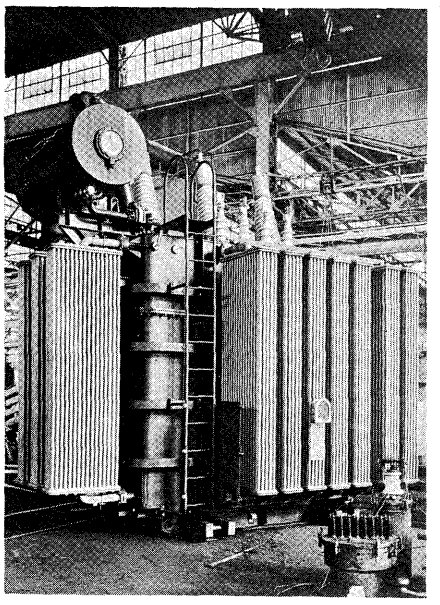


Fig. 7 20 MVA transformer

Type :	Nitrogen gas completely sealed, transportable type.	
Capacity :	4,500 kVA	3,000 kVA
Impedance :	4.46% at 4,500 kVA base	4.40% at 3,000 kVA base
Total weight (also during the transportation)	14.8 tons	11.2 tons

2. Expansion Circuit Breakers

(1) 168 kV 400 A 2,500 MVA at 168 kV 3 sets

(2) 72 kV 600 A 1,500 MVA at 72 kV 11 sets

3 pole single throw pneumatic drive type

3. Disconnecting Switches

(1) 161 kV 600 A 4 sets

(2) 69 kV 1,200 A 3 sets

(3) 69 kV 600 A 17 sets

Each set is pneumaitcally drived and some of them used for receiving lines are provided with the earth grounding devices.

A group of 66 kV disconnecting switch insulators are shown in *Fig. 8.*

4. Coupling Capacitor Potential Device

(Nisshin Electric Co., Ltd. make)

(1) $\frac{154}{\sqrt{3}}$ kV / $\frac{110}{\sqrt{3}}$ V / $\frac{110}{3}$ V 1 set (3 phases)

(2) $\frac{66}{\sqrt{3}}$ kV / $\frac{110}{\sqrt{3}}$ V / $\frac{110}{3}$ V 3 sets (9 phases)

5. Curret Transformers

(1) 161 kV use 12 phases

(2) 69 kV use 9 phases

They are housed in supporting insulator of expansion circuit breakers.

6. Lightning Arresters

(Tokyo Shibaura Electric Co., Ltd. make)

(1) 161 kV use 3 phases

(2) 69 kV use 9 phases

They are installed at the incoming lines of substations through the three PST gang drive connecting switches.

7. 11.5 kV and 3.45 kV Metal-Clad Switchgears

(1) 11.5 kV use total 34 cubicles

(2) 3.45 kV use total 68 cubicles

The gross total of these indoor use switchgears is over 100 cubicles and occupies the main parts of this distributing equipment.

Each cubicle unit contains one oil circuit breaker and other apparatuses and are provided with F class conditions required by JEM 1114 (1959) (see *Fig. 9~12*)

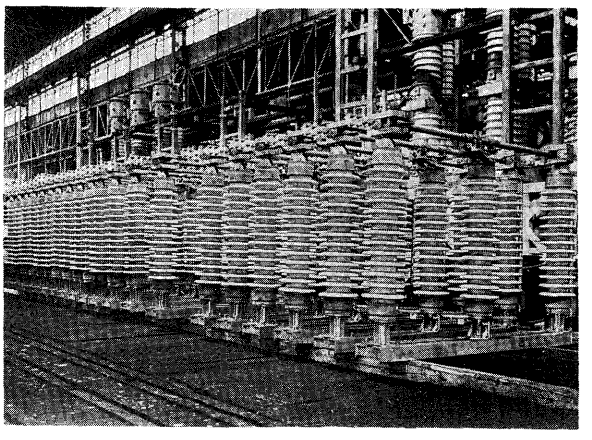


Fig. 8 60 kV disconnecting switch

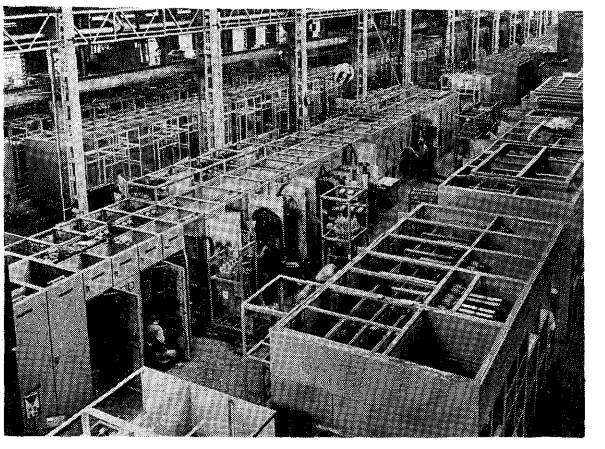


Fig. 9 View of switchgears under assembling

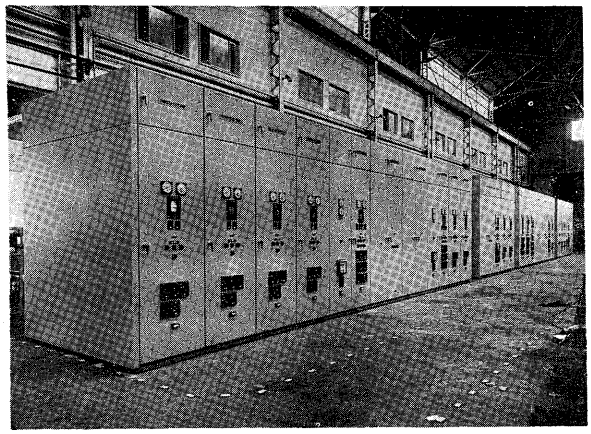


Fig. 10 11.5 kV switchgears for blast furnace S.S.

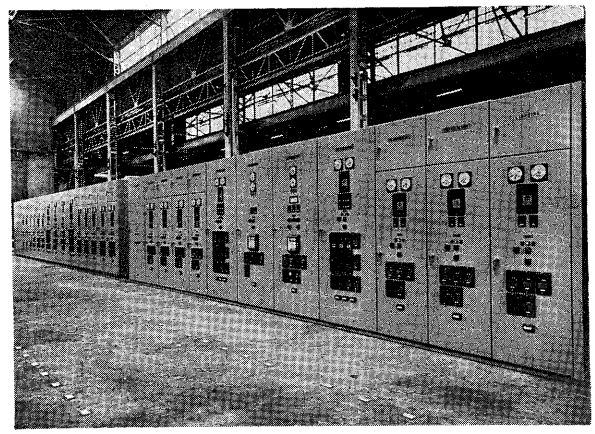


Fig. 11 3.45 kV switchgears for coke and chemical by-products transformer room

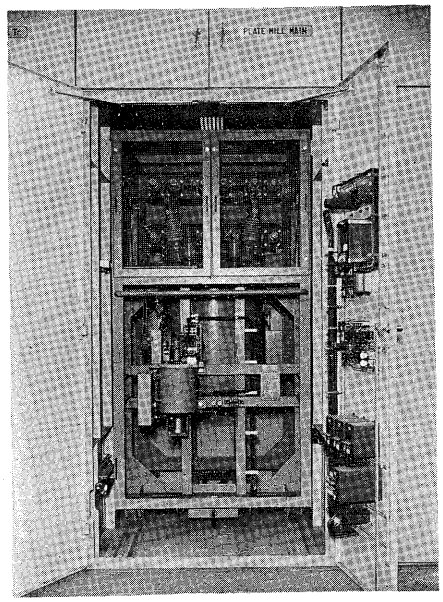


Fig. 12 12 kV 2,000 A 500 MVA OCB

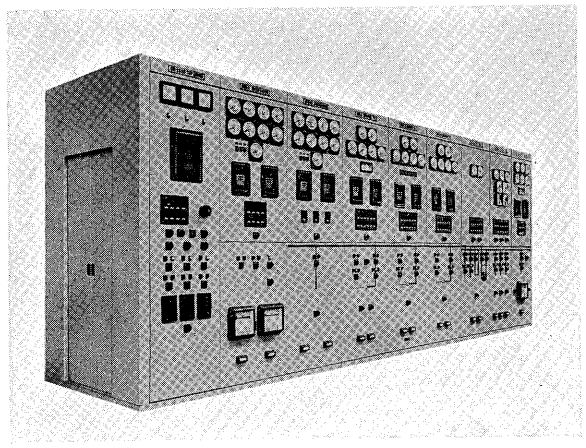


Fig. 13 Main switchboard for receiving S.S.

8. Main Switchboard

(1) Receiving substation 1 set (9 panels)
Used for 1×154 kV receiving, 1×66 kV receiving (spare), 3×30 MVA on-load tap changing transformers and 4×66 kV feeders (see *Fig. 13*).

(2) Blast furnance substation 1 set (5 panels)
Used for 2×66 kV receiving, 2×20 MVA transformers and 6×11.5 kV feeders.

(3) Water substation 1 set (5 panels)
Used for 1×66 kV receiving, $2 \times 7{,}500$ kVA transformers and 8×3 kV feeders.

Type of switchboard: indoor use self-stand sheet iron made enclosed vertical type.

They are mounted with instruments and controlling apparatus on front panels and protecting relays on back panels.

9. Superviosry controlling panels

(1) Receiving substation 1 sets (2 panels)
Used for tele-controlling of rolling mill substation and plate & slabbing mill transformer room.

(2) Blast furnace substation 1 set (4 panels)
Used for tele-controlling of oxygen electric room, converter electric room, blast furnance transformer room, coke and chemical by-products transformer room.

Type of panel: indoor use self-stand sheet iron made enclosed vertical type.

In regard to the controlling and indication of rolling mill substation and blast furnance transformer room, the selective device by transister set are not used, but the straight transmission system are adopted, as the substation and the transformer room are annexed respectively to the controlling substations which are receiving substation and blast furnace substation respectively.

On the other hand, the selective device for

the controlling and indication of the tele-controlled substation except above are transisterized and by this, we were able to reduce the quantities of transmission cable wires.
The tabular specification is shown in *Table 3*.

10. Series Capacitor Equipment

(Nisshin Electric Co., Ltd. make)

3 phase 8,400 kVA terminal voltage 5,000 V 8.9 Ω.
This aims to reduce the voltage variation due to the rolling mill loads and is provided with standard fittings.

11. Parallel Capacitor Equipment

(Nisshin Electric Co., Ltd. make)

3 phase 69 kV 5,0000 kVA 2 banks
This aims to improve the power-facter and is provided with standard fittings.

12. Water Spray Washing Equipment

(Nohmi Bosai Kogyo K.K. make)

In four substations of receiving substation, rolling mill substation, blast furnace substation and water substation the water spray washing equipment are installed to prevent insulator deterioration by the result of adhension of smoky dust. The tabular specification is shown in *Fig. 4*.

13. Others

(1) Compressed air generating equipment 4 sets
Indoor use AC 3.7 kW, DC 3.7 kW motor drive.
Compressed air : 5 kg/cm²
Air reservoir : 500 litres
Accessories : Control panel (as shown in *Fig. 14*) and piping materials.

(2) House power transformers 9 sets
3 phase 60 c/s 100 kVA or 75 kVA.
2 ry side connection : 460 V, 230 V, series-parallel connection.

(3) House power source panels 9 panels
AC 440 V use 3 panels
AC & DC 220 V use 6 panels

(4) Batteries with chargers 6 sets
(a) Battery

***Table 3* Technical particulars of superviosory controlling equipment**

Controlling station	Contolled station	Distance	No. of controlled OCB	Kinds of fault indication	Number of elements of measured voltage & current	System
Receiving S.S.	Rolling mill S.S.	adjacent	3 sets for 10 kV line	6	10 kV V 1 10 kV C 3	Direct
	Plate & slabbing mill Tr. room	0.6 km	6 sets for 10 kV line 11 sets for 3 kV line	9	10 kV V 2 10 kV C 6 3 kV V 2 3 kV C 11	Transisterized
Blast Furnace S.S.	Blast furnace Tr. room	adjacent	11 sets for 3 kV line 2 sets for engine starting	7	3 kV V 2 3 kV C 13	Direct
	Oxygen electric room	1.5 km	3 sets for 10 kV line	9	10 kV V 1 10 kV C 3 3 kV V 2 3 kV C 18	Transisterized
	Converter electric room	0.8 km	2 sets for 10 kV line 11 sets for 3 kV line 1 set for engine starting	9	10 kV V 1 10 kV C 2 3 kV V 1 3 kV C 11	Transisterized
	Coke & chemical by-products Tr. room	1.5 km	3 sets for 10 kV line 9 sets for 3 kV line	9	10 kV V 1 10 kV C 3 3 kV V 2 3 kV C 9	Transisterized

***Table 4* Technical particulars of water spray washing equipment**

Technical particulars \ Name of substation	Receiving S.S. including rolling mill S.S.	Blast furnace S.S.	Water S.S.
Washing system	Spray	Spray	Spray
Capacity of pump	3,750 *l*/min head 70 m	1,800 *l*/min head 70 m	1,800 *l*/min head 70 m
Driving motor	95 kW 3 ϕ 440 V 60 *c/s*	37 kW 3 ϕ 440 V 60 *c/s*	37 kW 3 ϕ 440 V 60 *c/s*
Capacity of reservoir	250 k*l*	40 k*l*	40 k*l*
Control panel	1 set	1 set	1 set
Number of magnetic valve	32 pcs	8 pcs	7 pcs

Remark : S.S. stands for substation.

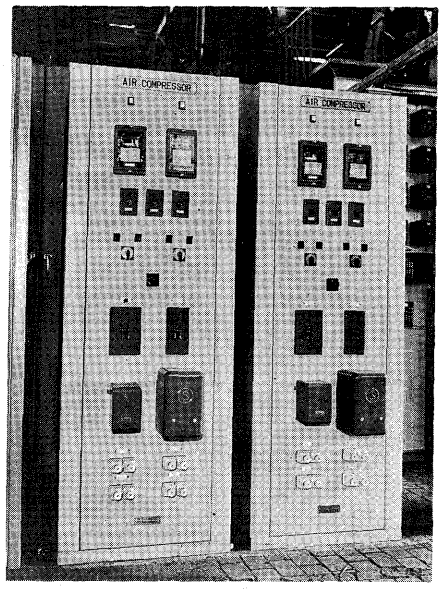


Fig. 14 Air compressor control panel

Indoor use enclosed paste type ebonite made stationary batteries voltage 220 V 100 AH or 200 AH at 10 hours rate

(b) Charger

Indoor use self-stand self-cooled cubicle type with automatic voltage constant device.

Input : 3 phase 220 V 60 c/s

Output : DC 230 V 30 A

(5) Neutral grounding resistors 9 sets

The neutral side of secondary winding of each transformer will be grounded with the neutral resistors (rated current 300 A).

IV. CHARACTERISTICS OF THE EQUIPMENT

1. Countermeasures against voltage fluctuation

The voltage fluctuation at a certain point is arised from that of the source side and that of the loads.

Especially in iron steel works which have such loads as plate, slabbing, hot and cold strip mills, power consumption changes over wide range from base to peak.

As countermeasures to compensate this voltage fluctuation, the receiving transformers are provided with on-load tap changing equipments and the series capacitor equipment is prepared.

1) 30 MVA on-load tap changing transformers

The transformer has 162 kV maximum tap, 154 kV rated tap, 142 kV minimum tap with $9\times\pm2$ kV tap voltage.

The connection of the transformer being designated as the standard connection of transformer winding in Brazil, primary delta and secondary star with neutral bronghtout, the Yansen type tap changing equipment is mounted on the neutral side of secondary windings. This is because it requires high insulation strength and moreover is very uneconomical to attach the on-load tap changing equipment respectively to each primary winding.

And in order that the connecting leads to the on-load tap changer are easily drawn out, the arrangement of two windings is the primary inside and the secondary outside.

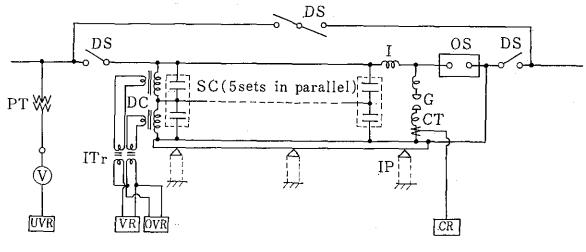
So, two pumps for forced oil circulation are equipped to prevent the iron core and the windings from local over heating.

Our Company has manufactured many on-load tap changing transformers (total two million kVA) with Yansen type switch and has been enjoying good reputations.

It is posible for this transformer which is provided with an oil purifier against contaminated oil in the switch room to assure tap-change of 300,000 times under rated current.

2) Series capacitor equipment

The series capacitor equipment is directly inserted to the secondary 66 kV line of 3×30 MVA transformers and has rated capacity of 8,400 kVA (capacitive reactance 8.9 Ω, rated terminal voltage



SC: Series capacitors
G: Protective gaps
OS: Oil switch
DC: Discharging coils
CT: Current transformers
IP: Insulation pedestals
ITr: Insulation transformer

Fig. 15 Skeleton diagram of series condenser equipment

5,000 V, rated current 560 A), with protective gaps, current limitting reactors, discharging coils, insulation transformers and current transformers (see *Fig. 15*).

As is well known, the voltage fluctuation depends on the impedance of the electric source and the fluctuation of the load.

The series capacitor compensates the inductive reactance of the system and controls the volatge automatically in accordance with the loads.

Moreover, from the viewpoint of maintenance, the static apparatus is desirable and is rather low in cost.

The fluctuation of voltage will be reduced to half as much as compared to that without series capacitor at the first period of Intendente Camara Works as shown in *Fig. 16* and *Fig. 17*.

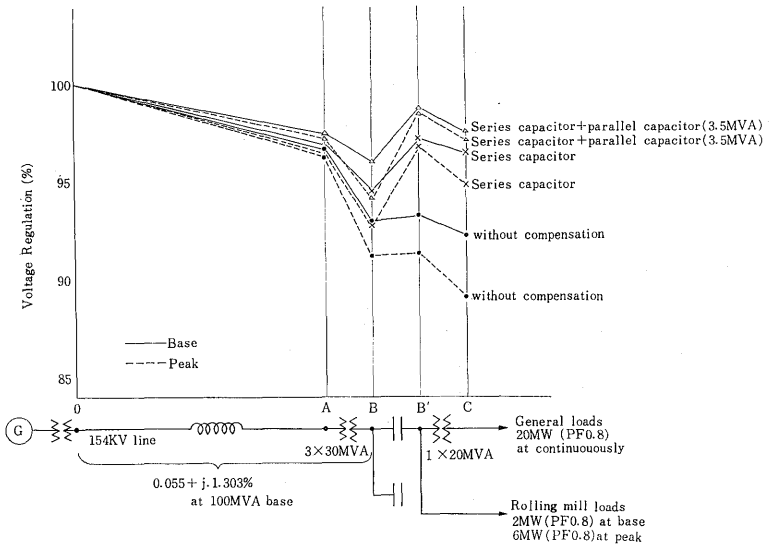


Fig 16 Voltage drop in system under rolling mill loads for first period

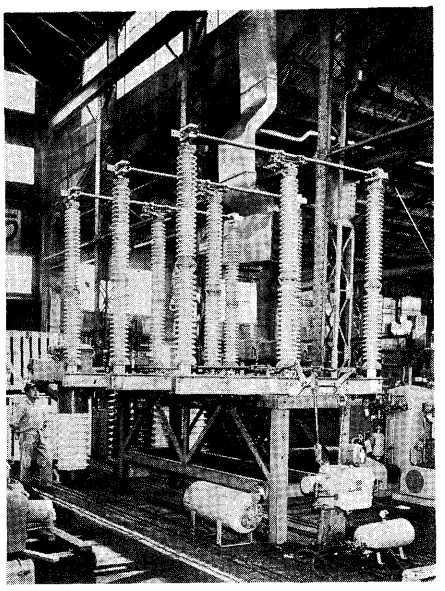


Fig. 18 154 kV disconnecting switch

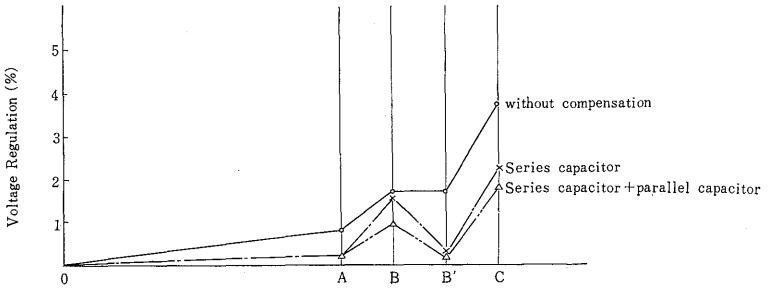


Fig. 17 Voltage regulation in system under rolling mill load

2. Countermeasure aginst contamination of insulators

The countermeasure against contamination of insulator due to adhesion of salty atmosphere is an important problem for a power station or a substation which is located at the sea shore in our country.

But it is no fear at Intendente Camara Works, because the plant is located about 250 km distance far from the Atlantic Ocean.

In spite of this, four substations, i.e. receiving substation, rolling mill substation, blast furnace substation and water substation are prepared with the water spray washing equipment on living line considering that the scattering of the dry soil containing the iron components and the smoky atomosphere puffed out from the works will cause the source of trouble with the system.

As we can not help waiting to catch quantitatively the degree of contamination until the production will be started, we assume it is middle class (0.05 mg/cm^2 in salty quantities) considering the local conditions and the meteorological conditions, etc.

Actually, the insulation class of insulators is raised one step more than to normal voltage and it is one example that the insulators of 154 kV DS are of high precision, thin diameter, mid solid, station post type and the leakage path is equivalent to No. 200 (BIL 1,050 kV) (see *Fig. 18*).

On the other hand, 2～3 spray nozzles are fixed to one insulator (see *Fig. 19*) and water is sprayed by remote control through the automatic operation

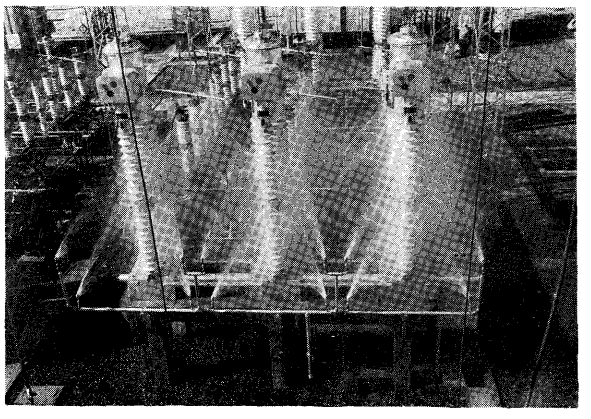


Fig. 19 View of water spray washing for 72 kV ECB under loading

valves. As the control panel is installed in the switchboard room, any operator is not necessary for this equipment, but the switchboard attendant can also make operation and maintenance.

The works may become a famous place for the water spray washing equipment, because there has been no such a equipment in Brazil.

3. System controlling and protective method

1) Centralized controlling and power accommodation

As the loads connected to this distributing equipment are for blast furnaces, rolling mills and chemical by-products plant etc. plant and they compose the continuous production system, it is necessary to distribute rationally electric power.

Moreover to minimize maintenance cost, we planned the centralized control and automation system as follows.

That is, as the electric rooms except water substation are respectively equipped with supervisory control equipment, the centralized tele-control is possible from receiving substation and blast furnace substation to each tele-controlled room.

The control panels can manage the following function : control and indication of each OCB, fault indication, metering of line voltage of receiving circuit, metering of one phase current of each feeder and start indication of diesel generator.

When the distance between controlling room and controlled room is over 500 m, we adopted the transistor set which our Company has developed at the first time in Japan.

Since we applied the transistor set for Yamaie S.S. of Kyushu Electric Co., Ltd. in 1956, we have delivered over 40 sets for our customers and have been held in high opinion.

This is a popular favourite of this era, replacing apparatus using relays and has many merits as follows.

(1) Permanence of life.

(2) Composition of small, light and economical components.

(3) Speedy responce and reliable operation against voltage regulation.

(4) Reduction of number of transmission cables.

In addition to the abovementioned controlling method the following power accommodation has been schemed out.

As the outputs in blast furnace section are badly influenced by the power stoppage by any chance, the 3.45 kV spare tie-lines are equipped between electric rooms to make the system compose local loop circuit. And moreover, two sets of diesel generator in blast furnace transformer room and one set in converter Electric Room (each 1,250 kW) are equipped and in an emergency by power stoppage they start automatically and insure the security powers.

In initial state of stoppage the electric power of diesel generators is supplied respectively in each transformer room, but as the loads are functional to time and also it is possible to voluntarily transfer the electric power generated by each diesel generator sets between each other through the 11.5 kV circuits.

The diesel engines were made by Mitsubishi Heavy Industries, Reorg., Ltd. and the generators and starting panels were made by Mitsubishi Electric Mfg. Co., Ltd. and the panels are installed on the switchboard rooms which accommodate the main switchboards made by our Company.

Consequently it is possible to do centralized control and systematic power supply, even if in an emergency.

2) Protective method

The similar protective methods for all substations and transformer rooms are adopted to decrease the kinds of relays and to obtain easy interchangeability.

For example, they are the ratio differential relays for transformer, the over current relays or over current ground relays for feeders and the under voltage relays or over voltage ground relays for buses. And still more the pilot wire relay equipment is adopted to the 3×66 kV OF cable lines connected from receiving substation to blast furnace substation or water substation and close the high speed and selective trip circuits for circuit breakers at both ends when the cables are shorted or grounded by an accident.

As these are generally adopted, we shall introduce only the details of protective scheme of series capacitor equipment.

(1) Over voltage protection

The overvoltage caused by a system accident or an abnormal phenomenon is discharged through the protective gap which is arranged to capacitors in parallel and discharges at the 2.5 times voltage of rated voltage.

And the instantaneous over current relay connected to this circuit is operated and the by-pass switch is closed to short the series capacitor.

(2) Over load protection

Continuous over loads of the series capacitors caused by continuous line over currents are detected by the over voltage relays connected to the secondary circuits of discharge coils through insulation transformers and the by-pass switch short-circuits the capacitors.

(3) Internal fault of unit

As each capacitor unit has a middle tap, an internal element puncture is easily detected by the voltage difference between these two series stages of element. For this purpose the sensitive over voltage relays are connected to the secondary circuit of dis-

charge coils through the differentially connected secondary windings of insulation transformes.

Thus the by-pass switch short-circuits the capacitors as above (2).

(4) Prevention of series capacitors from invention in no-voltage line

At the no voltage condition of the line, the series capacitor equipment is short-circuited by the under voltage relay connected to the secondary winding of potential transformer.

4. Spares and Accessories

The delivery place, Intendente Camara Works, is situated in opposite side of the globe over the equater from Japan.

This being surely an unfavourable point for transportation of the equipment, mutual communication and after-service, we paid special attention to prevent the equipment from being injured during transportation.

And moreover, we prepared the spares and accessories taking safety factor, into consideration especially for fragile parts.

The kinds of spares are about 300 and the total quantities reachs to 1,000 pieces.

On the other hand the following main accessories are supplied.

For transformers : two oil tanks (one of them is convenient for transportation), one portable oil purifier, one oil filter, two withstand voltage device for oil, one leakage detector, and one vacuum pump, etc.

For expansion circuit breakers : two kinds of chamber lifters (one is for 168 kV ECB and the other is for 72 kV ECB) etc.

For switchboards : one set of portable type relay testing set and three sets of desk for supervier, etc.

For metal-clad switchgear : 10 sets of OCB testing rack and transfer truck, etc.

V. CONCLUSION

We described an outline of the electrical receiving and distributing equipment for first period for USIMINAS.

Conference on technical problems were held many times, too, in process of planning and manufacturing. Thus, the shipment were completed from Yokohama in May, 1961 (see *Fig. 20*).

Now, at the erection field the delivered goods are being assembled for the purpose of building a fire in blast furnace in March, 1962.

On the other hand, at our works 100 load-center panels to be connected to this equipment will be soon shipped (see *Fig. 21*) and the additional distributing equipment for second period is being manufactured.

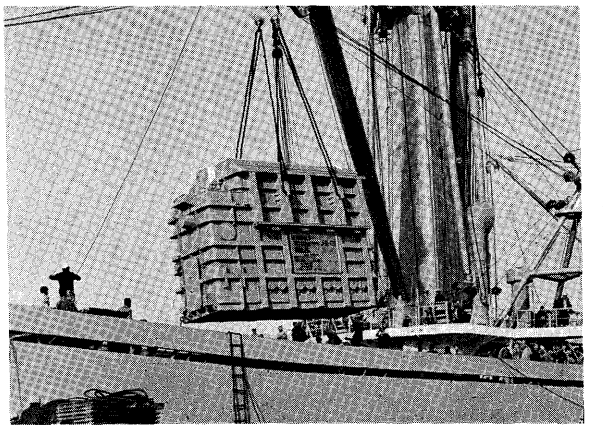


Fig. 20 Shipping of 30 MVA transformer

Nowadays many advanced countries of the world invest the capital and give their technical assistance for enterprises of foreign countries, especially for iron steel works.

For instance U.S.A. to Brazil (Volta Redonda), England, U.S.S.R. and West Germany to India and these tendency are remarkable and they compete with each other.

Under the circumstances, we believe it is very significant that our Company has accomplished successful manufacture of this equipment for USIMINAS, because this work will attract international notice towards Japan.

We thank Mr. Fujita, Technical Bureau of Nippon USIMINAS Co., Ltd. and Mr. Abe, Construction Bureau of Yawata Iron & Steel Co., Ltd. for kindly extending assistance and many data, and all the others pertaining to the completion of this equipment for sincere co-operation.

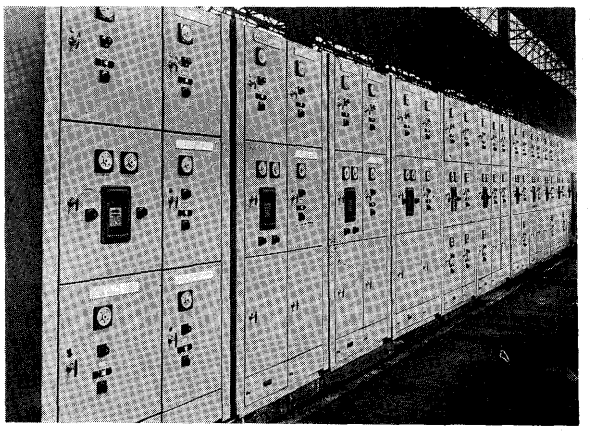


Fig. 21 A group of 2ry side panels of load-center before shipping