9.2 Chemical Industry

9.2.1 Chemical Industry (Blachownia, Poch)

- (1) Ethylbenzene
 - a. Purpose of measurement

The purpose is to grasp the status of energy use in the ethylbenzene manufacturing process.

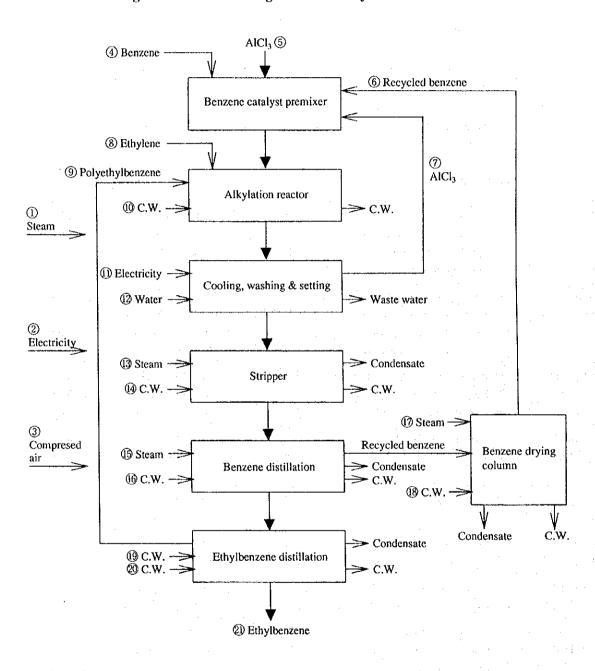
b. Measurement items, measurement time, measuring equipment, and data processing

	Measurement items	Measurement time	Measuring equipment	Data processing
Total	 Total steam flow rate Total power consumption 	24 h 24 h	Meter for operation Clamp meter	Memo to FDD
· · · ·	 3 Total power consumption air consumption 	24 h	Meter for operation	Memo
Benzene	(d) Amount of charged benzene	24 h	Operation record	Memo
catalyst	5 Amount of charged AICl ₃	24 h	Operation record	Memo
premixer	6 Benzene consumption	24 h	Operation record	Memo
	⑦ Amount of recycled AlCl ₃	24 h	Operation record	Memo
Alkylation	⑧ Amount of charged ethylene	24 h	Operation record	Memo
reactor	④ Polyethylbenzene amount	24 h	Operation record	Memo
	① Cooling water amount	24 h	Meter for operation	Memo
Cooling,	① Power consumption	24 h	Clamp meter	to FDD
washing & setting	Water amount	24 h	Ultrasonic flowmeter	to Recorde
Stripper	③ Steam flow rate	24 h	Meter for operation	Memo
* *	① Cooling water amount	24 h	Meter for operation	Memo
Benzene	(1) Steam flow rate	24 h	Meter for operation	Memo
Distillation	(Cooling water amount	24 h	Meter for operation	Memo
Benzen	1 Steam flow rate	24 h	Meter for operation	Memo
drying colmn	③ Cooling water amount	24 h	Meter for operation	Memo
Ethylbenzene	(9) Steam flow rate	24 h	Meter for operation	Memo
distillation	② Cooling water amount	24 h	Meter for operation	Memo
	Product output	24 h	Operation record	Memo

Note) The surface temperature should be measured, as required, by using a surface thermometer, radiation thermometer, etc. in order to grasp the heat insulation status of each equipment.

c. Measuring points

Figure 9.2.1 shows the measuring points for ethylbenzene.





(2) Benzene

a. Purpose of measurement

The purpose is to grasp the status of energy use in the benzene manufacturing process.

	Measurement items	Measurement time	Measuring equipments	Data processing
Total	① Total steam flow rate	24 h	Meter for operation	Memo
	② Total power consumption	24 h	Clamp meter	to FDD
	③ Total COG amount	24 h	Meter for operation	Memo
	④ Total amount of compressed air	24 h	Meter for operation	Memo
Crude	5 Crude benzene	24 h	Operation record	Memo
benzene	6 Steam flow rate	24 h	Meter for operation	Memo
vaporizer	⑦ Amount of reactant	24 h	Operation record	Memo
Reactor	⑧ COG flow rate	24 h	Operation record	Memo
	(9) Steam flow rate	24 h	Meter for operation	Memo
Stripper	① Steam flow rate	24 h	Meter for operation	Memo
	① Cooling water amount	24 h	Meter for operation	Memo
	H ₂ S amount	24 h	Operation record	Memo
B.T.X.	① Steam flow rate	24 h	Meter for operation	Memo
distilation	() Cooling water amount	24 h	Meter for operation	Memo
	③ Product output (Benzene)	24 h	Operation record	Memo
	③ Product output (Toluene)	24 h	Operation record	Memo
	Product output(Sloventnaphtha)	24 h	Operation record	Memo
	Product output (Others)	24 h	Operation record	Memo

b. Measurement items, measurement time, measuring equipment, and data processing

Note) The surface temperature should be measured, as required, by using a surface thermometer, radiation thermometer, etc. in order to grasp the heat insulation status of each equipment.

c. Measuring points

Figure 9.2.2 shows the measuring points for benzene.

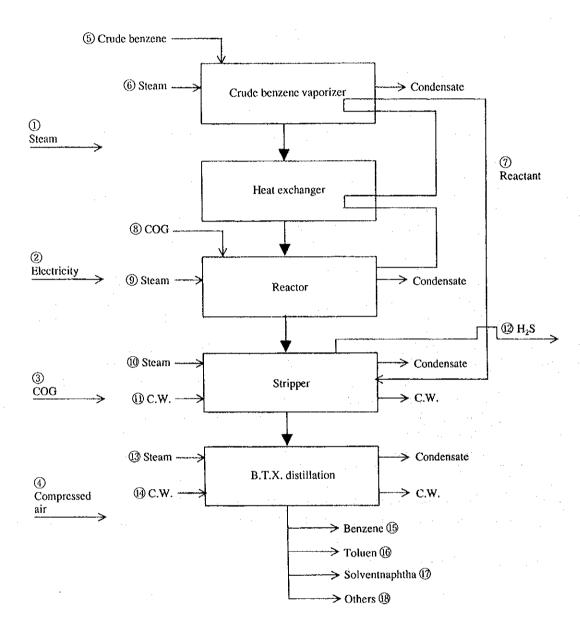


Figure 9.2.2 Measuring Points of Benzene Process

(3) Tar

a. Purpose of measurement

The purpose of measurement is to grasp the status of energy use in the tar manufacturing process.

	Measurement items	Measurement time	Measuring equipment	Data processing
Total	① Total steam flow rate	24 h	Meter for operation	Memo
	② Total power consumption	24 h	Clamp meter	to FDD
	③ Total amount of COG	24 h	Operation record	Memo
	④ Total amount of compressed air	24 h	Meter for operation	Memo
Dehydrator	(5) Total amount of tar	24 h	Operation record	Memo
•	6 Amount of recycled tar	24 h	Operation record	Memo
Pipe still	⑦ COG flow rate	24 h	Meter for operation	Memo
-	⑧ Amount of other fuels	24 h	Operation record	Memo
	④ Amount of flue gas	24 h	Meter for operation	Memo
	① Amount of recycled bottom	24 h	Operation record	Memo
Distillation	① Steam flow rate	24 h	Meter for operation	Memo
	① Cooling water	24 h	Meter for operation	Memo
	① Product output (Phenol)	24 h	Operation record	Memo
	19 Product output (Naphthalene)	24 h	Operation record	Memo
	() Product output (Absorbent)	24 h	Operation record	Memo
Distillation	(b) Steam flow rate	24 h	Meter for operation	Memo
(Vacuum)	① Cooling water amount	24 h	Meter for operation	Memo
	Product output (Heavy oil)	24 h	Operation record	Memo
	(9) Product output (Anthracene)	24 h	Operation record	Memo
	② Product output (Pitch)	24 h	Operation record	Memo

b. Measurement items, measurement time, measuring equipment, and data processing

c. Measuring points

Figure 9.2.3 shows the measuring points for the tar process.

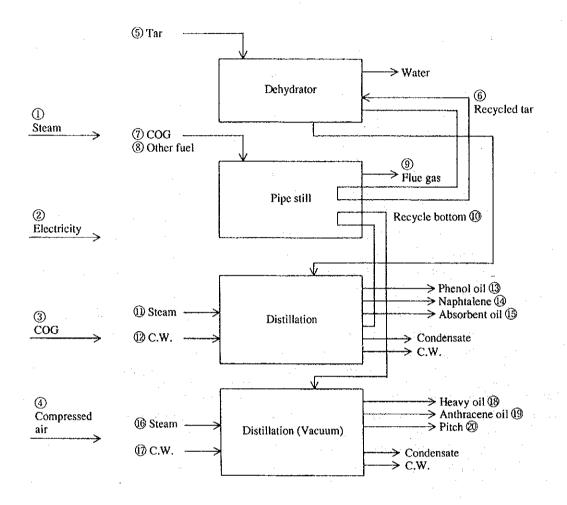


Figure 9.2.3 Measuring Points of Tar Process

(3) Energy utilization facilities

Equipment name	Targeted equipment or location	Measurement time
Electricity management	Power receiving facilities	24 h
Fan/blower	Boiler exhaust fan	24 h
Electric motor	Boiler feedwater	24 h
Air compressor	Major equipment	24 h
Pump	Cooling water pump	24 h
Transformer	Major equipment	24 h
Lighting	Various locations in the factory	spot
Boiler	Boiler room	24 h
Steam pipe	Various locations in the factory	spot

For the measurement method and the measuring points, see "10. ENERGY UTILIZATION FACILITIES".

9.2.2 Dyestuff (Boruta)

- (1) Dyestuff
 - a. Purpose of measurement

The purpose of measurement is to grasp the status of energy use in the dye manufacturing process.

b. Measurement items, measurement time, measuring equipment, and data processing

	Measurement items	Measurement time	Measuring equipment	Data processing
Total	 Total steam flow rate Total power consumption Total amount of compressed air 	24 h 24 h 24 h 24 h	Meter for operation Meter for operation Meter for operation	
Raw material	④ Raw materials (Amount and composition)		Operation record	
Tank	(5) Steam flow rate(6) Water amount	24 h 24 h	Meter for operation Meter for operation	
Tank	⑦ Steam flow rate⑧ Water amount	24 h 24 h	Meter for operation Meter for operation	
Pump	 (9) Water amount (10) Compressed air (Amount and pressure) 	24 h 24 h	Meter for operation Meter for operation	
Filter press	① Compressed air (Amount and pressure)	24 h	Meter for operation	
Tank	③ Steam flow rate④ Water amount	24 h 24 h	Meter for operation Meter for operation	
Tank	If Steam flow rateIf Water amount	24 h 24 h	Meter for operation Meter for operation	
Pump	 Water amount Compressed air (Amount and pressure) 	24 h 24 h	Meter for operation Meter for operation	
Filter press	③ Compressed air (Amount and pressure)	24 h	Meter for operation	
Tank	 Steam flow rate Water amount 	24 h 24 h	Meter for operation Meter for operation	
Tank	② Steam flow rate② Water amount	24 h 24 h	Meter for operation Meter for operation	
Spray dryer	23 Steam flow rate24 Water amount29 Power consumption	24 h 24 h 24 h	Meter for operation Ultrasonic flowmeter Clamp meter	
Product	Ø Product output	24 h	Operation record	

c. Measuring points

Figure 9.2.4 shows the measuring points for the dyeing process.

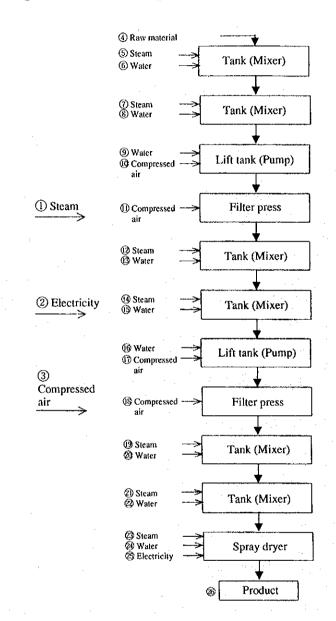


Figure 9.2.4 Measuring Points of Dyeing Process

(3) Energy utilization facilities

Equipment name	Targeted equipment or location	Measurement time
Electricity management	Power receiving facilities	24 h
	NH3 refrigerator	24 h
	Dyeing shop	24 h
Fan/blower	Blower for dryer	24 h
Electric motor	Major equipment	24 h .
Air compressor	NH3 compressor	24 h
Pump	Major equipment	24 h
Transformer	Major equipment	24 h
Lighting	Various locations in the factory	spot
Boiler		
Steam pipe	Various locations in the factory	spot

For the measurement method and the measuring points, see "10. ENERGY UTILIZATION FACILITIES".

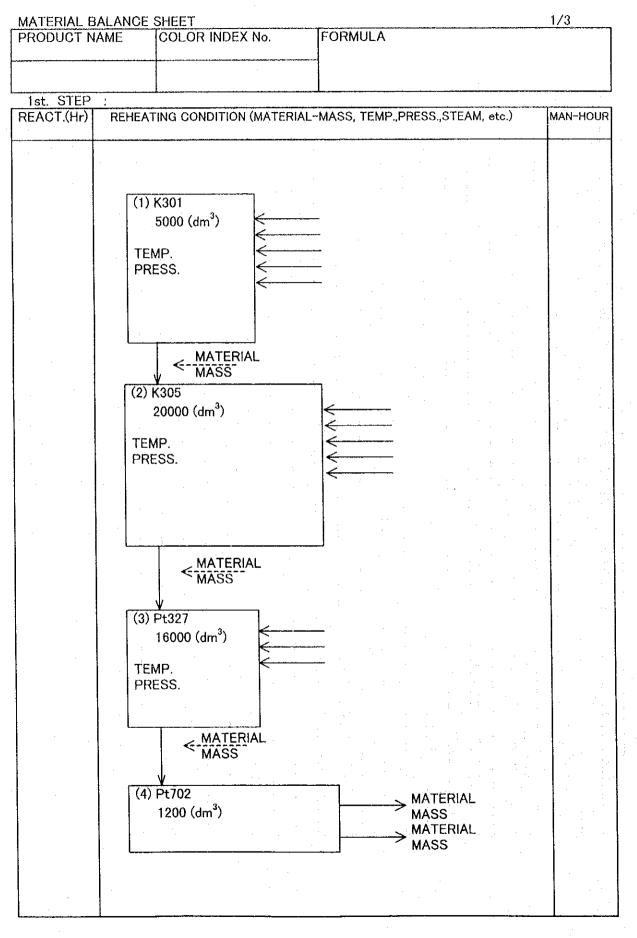
Check list for BORUTA S.A.

No.	ltem	Unit					
	1 Production		1993	1994	1995	1996	1997
1.1	1.1 Direct dve	ton/y					
1.2	1.2 Acid dve	ton/y	- -				
1.3	1.3 Reaction dye	ton/y					
14	1.4 Others	ton/y					
	Total	ton/y					
2	2 Energy consumption		1993	1994	1995	1996	1997
2.1	2.1 Steam	GJ/y					
2.2	2.2 Electricity	MWh/y					
2.3	2.3 Ice	ton/y			-		
2.4	2.4 Compressed air	Nm3/y					
2.5		m3/y	1				
2.6	2.6 Others						
			1				
e	3 Energy price		1997	1998			
3.1	3.1 Steam	PLN/t					
3.2	3.2 Electricity	PLN/kWh					
3.3	3.3 lce	PLN/t					
3.4	3.4 Compressed air	PLN/Nm3					
3.5	3.5 Water	PLN/m3					
3.6	3.6 Others						
					-		

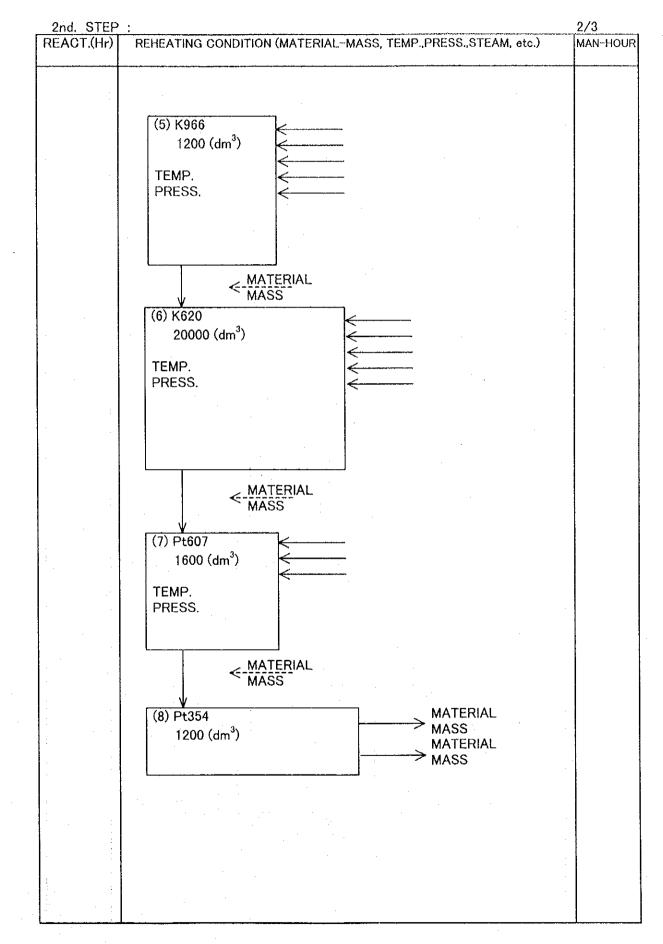
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		l drawings																				
		s, Sectiona																				
•		ure drawing																				
		tion, Stucti		 -															-			- -
		ation condi			-												-					
		cess : Capacity, Opera									b0			•					-			· · · · · · · · · · · · · · · · · · ·
		4 Specifications of Unit Process : Capacity, Operation condition, Stucture drawings, Sectional drawings	Reactor		4.2 Lift tank (Pump)		4.3 Spray dryer and	process control system	4.4 Filter press		5 Space heating in Building	5.1 Calculation sheet of	Space heating load		6 Process flow diagram					-		
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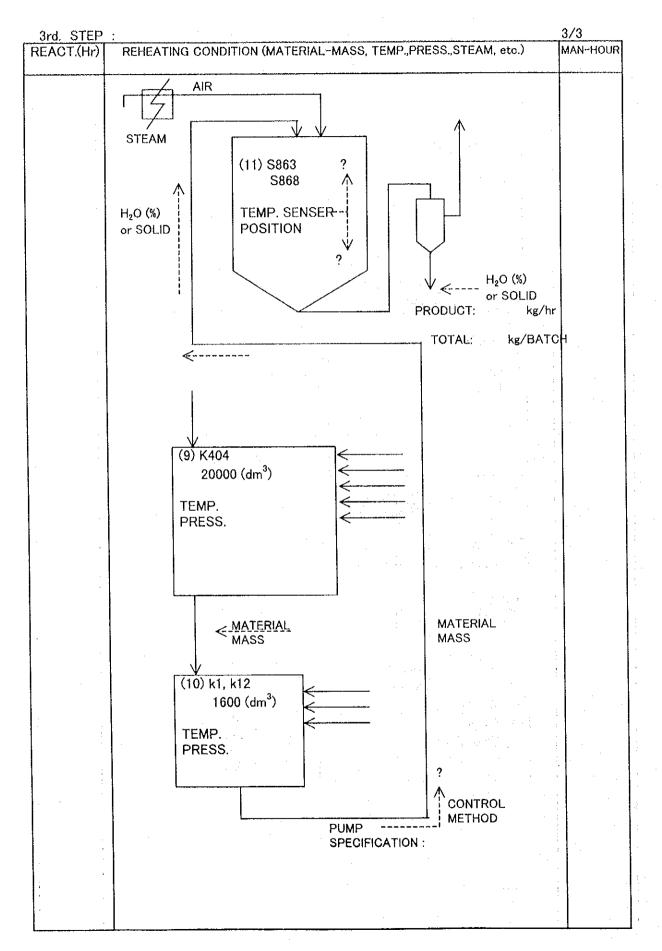


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V-9-2-13

9-2-15



V-9-2-14

9-2-14

9.3 Machine Manufacturing Industry

9.3.1 Tractor and Truck (Ursus and Star)

(1) Cupola

a. Purpose of measurement

The purpose of measurement is to survey the current operating status in order to perform heat balancing of the cupola.

b. Measurement items, measurement time, measuring equipment, and data processing

	Measurement items	Measurement time	Measuring equipment	Data processing
	haust gas temperature before at recovery	24 h	Thermocouple	to Recorde
② Ex	haust gas pressure before heat	24 h	Low pressure indicator	to Recorde
	haust gas O_2 % before heat covery	24 h	O ₂ meter	to Récorder
	haust gas CO % before heat covery	24 h	CO, CO_2 meter	to Recorder
	haust gas CO ₂ % before heat	24 h	CO, CO_2 meter	to Recorde
	haust gas temperature after heat covery	24 h	Thermocouple	to Recorde
	haust gas pressure after heat covery	24 h	Low pressure indicator	to Recorde
(8) Ex	haust gas O_2 % after heat covery	24 h	O ₂ meter	to Recorde
	haust gas CO % after heat covery	24 h	CO, CO_2 meter	to Recorde
	haust gas CO ₂ % after heat covery	24 h	CO, CO_2 meter	to Recorde
	ot blast temperature before heat covery	24 h	Thermocouple	to Recorde
	ot blast pressure before heat covery	24 h	Low pressure indicator	to Recorde
() Ho	ot blast humidity % before heat covery	24 h	Thermo-hygrometer	Memo
🚇 на	ot blast temperature after heat	24 h	Thermocouple	to Recorde
🛈 Pri	imary side cooling water mperature	24 h	Thermocouple	to Recorde
16 Pr	imary side cooling water nount	24 h	Ultrasonic flowmeter	to Recorde
🛈 Se	condary side cooling water mperature	24 h	Thermocouple	to Recorde
	narged coke amount	24 h	Operation record	Memo
	narged pig iron amount	24 h	Operation record	Memo

V-9-3-1

c. Measuring points

Figure 9.3.1 shows the measuring points of cupola.

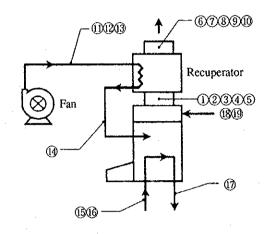


Figure 9.3.1 Measuring Points of Cupola

(2) Reheating furnace

a. Purpose of measurement

The purpose of measurement is to survey the current operating status in order to perform heat balancing of the heating furnace.

b. Measurement items, measurement time, measuring equipment, and data processing

	Measurement items	Measurement time	Measuring equipment	Data processing
1	Fuel consumption	24 h	Ultrasonic flowmeter	to Recorder
2	Fuel pressure	24 h	Pressure gauge	to Recorder
3	Fuel temperature	24 h	Thermocouple	to Recorder
4	Cooling water flow rate	24 h	Ultrasonic flowmeter	to Recorder
(5)	Cooling water inlet temperature	24 h	Thermocouple	to Recorder
6	Cooling water outlet temperature	24 h	Thermocouple	to Recorder
1	Billet charging temperature	24 h	Radiation thermometer	to Recorder
8	Billet extracting temperature	24 h	Radiation thermometer	to Recorder
9	Combustion air temperature at recuperator inlet	24 h	Thermocouple	to Recorder
10	Exhaust gas temperature	24 h	Thermocouple	to Recorder
0	Exhaust gas pressure	24 h	Low pressure indicator	to Recorder
12	Exhaust gas O ₂	24 h	O_2 meter	to Recorder
(3)	Exhaust gas CO ₂	24 h	CO, CO_2 meter	to Recorder
14	Exhaust gas CO	24 h	CO, CO_2 meter	to Recorder
15	Combustion air pressure at recuperator outlet	24 h	Low pressure indicator	to Recorder
10	Combustion air temperature at recuperator outlet	24 h	Thermocouple	to Recorder
Ø	Reheating furnace surface temperature	24 h	Surface thermometer	to Recorder
13	Furnace internal temperature	24 h	Radiation thermometer	to Recorder
Ō	Furnace internal pressure	24 h	Low pressure indicator	to Recorder
0	Power consumption for combustion air	24 h	Clamp meter	to Recorder

c. Measuring points

Figure 9.3.2 shows the measuring points of the heating furnace.

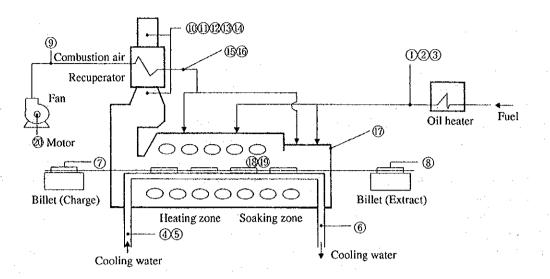


Figure 9.3.2 Measuring Points of Reheating Furnace

(3) Processes and lines

a. Purpose of measurement

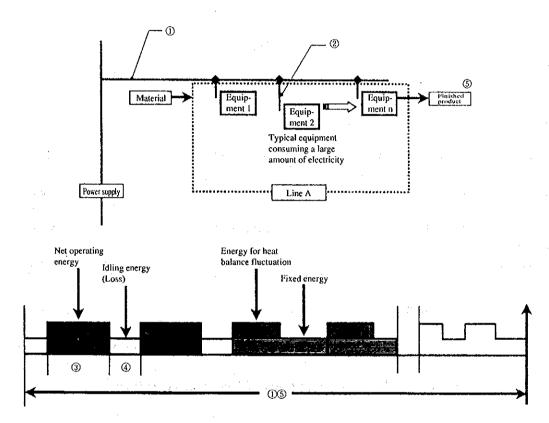
The purpose of measurement is to grasp the energy intensity per product for each line. The current state of energy consumption of typical equipment for each process and line should be surveyed.

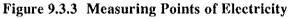
b. Measurement items, measurement time, measuring equipment, and data processing

Measurement items	Measurement time	Measuring equipment	Data processing
① Power consumption (For the entire line)	24 h	Clamp meter	to FDD
② Power consumption (For typical equipment)	24 h	Clamp meter	to FDD
③ Power consumption for the net fabrication cycle per piece of targeted work	24 h	Clamp meter	to FDD
④ Power consumption for the waiting period from the completion of one process to the	24 h	Clamp meter	to FDD
starting of the next process			
⑤ Daily production volume	-	Operation record	Memo

c. Measuring points

Figure 9.3.3 shows the measuring points of each line power consumption and typical equipment.





(4) Heating (Various locations of the factory)

a. Purpose of measurement

The purpose is to grasp the amount of energy loss in space heating at various areas of the factory.

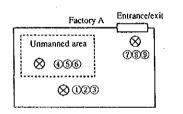
b. Measurement items, measurement time, measuring equipment and data processing

Measurement items	Measurement time	Measuring equipment	Data processing
 Floor temperature of manned work areas 	spot	Thermometer	Memo
② Temperature at human height in manned work areas	spot	Thermometer	Memo
③ Temperature near the ceiling of manned work areas	spot	Thermometer	Memo
(4) Floor temperature of unmanned work areas	spot	Thermometer	Memo
(5) Temperature at human height in unmanned work areas	spot	Thermometer	Memo
6 Temperature near the ceiling of unmanned work areas	spot	Thermometer	Memo
⑦ Floor temperature at factory entrance/exit	spot	Thermometer	Memo
⑧ Temperature at human height at factory entrance/exit	spot	Thermometer	Memo
(9) Temperature near the ceiling at factory entrance/exit	spot	Thermometer	Memo
10 Outdoor temperature	spot	Thermometer	Memo

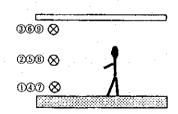
c. Measuring points

Figure 9.3.4 shows the measuring points for assessing energy loss in heating.

Figure 9.3.4 Measuring Points of Room Temperature



· · ·	Factory B	Entrance/exit
023 8		8 (799)
Parts storage	, etc. (Unmar	(4)5(6) (ned)⊗



(5) Energy utilization facilities

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Equipment name	Targeted equipment or location	Measurement time
Electricity management	Processes and lines	24 h
Air compressor	For processing	24 h
Fan/blower	For heating	24 h
Pump	Cooling tower system	24 h
Lighting	Various locations of the factory	spot
Boiler	Boiler room	24 h
Steam piping	Various locations of the factory	spot

For the measuring method and measuring points, see "10. ENERGY UTILIZATION FACILITIES".

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Check List for Process of Tractor Production

				Date		
				Surv	eyor	
General	information				. [.]	
(1) Factory	name		· ·			
	Company name:	ZPC "URSUS"				
(2) Adress	Factory:	02-495 Warsay	Y			
	Head Office :					
(3) Numbers	of Employees	н. Н		-		
		6864				
(4)Main Pro	ducts and produc	tion capacity				
	Name of Uni			Product	ion	Start-u
		······································		Capac	ity	year
(a) Tra	ctors type "C"					
(b) Hea	vy tractors typ)e "U"				
(c) Tra	ctors type "MP"					
(d)					,	
l						
(e)						

Products	1992	1993	1994	1995	1996	1997	2000
						(Plan)	(Plan)
(a) Tractors type "C"							
(b) Heavy tractors type "U"							
(c) Tractors type "MP"							
(d)							
(e)			•••••••••••••••••••••••••••••••••••••••				

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(6) History of the plant

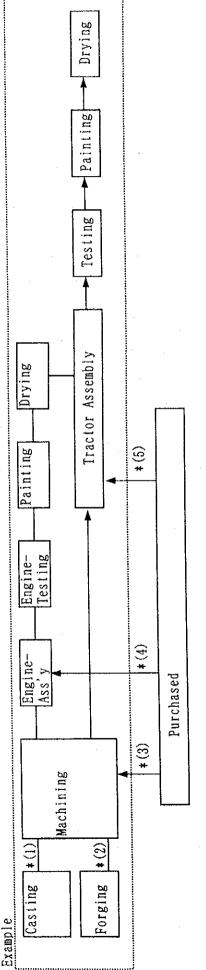
(Foundation and expansion the plant, rebuild, new production system share in the Industry, History of production etc.)

Foundation: -0x00113111540246157939111794410795151174756697794441971397741110144194041973760011444545341842045440555405554 History of expantion Share of products in Poland (6) Outline of Production Processes (Process Flow Sheet) Next page

(7) Factory and Plant Layout

Please separately prepare.

6. Out-line of production process Example



	Name of product/parts	Example
*(1)		Cylinder-block, Ccylinder-head
	•	Counter weight
+ (0)		Crank-shaft
+ (7)		Connecting-rod
* (3)		Bracket
* (4)		Fuel-pump, Starter
		e: = /]
* (5)		IIIre/wheel

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2. Transition of Energy Consumption

(1)Unit Price of Energy(1995-1996)

	Heat val	ue	Unit pric	e
Energy	Heat value	Unit	1995	1996
Coal		kcal/t	/1	/1
Fuel Oil		kcal/kl	/k1	/kl
Gas Oil		kcal/kl	/k1	/kl
Kerosene		kcal/kl	/k1	/k1
LPG		kcal/kg	/kg	/kg
Natural Gas		kcal/m3	/m3	/m3
Electricity			- - - -	
In-house	.,,	kcal/kWh	/k\h	∕k₩h
Purchased		kcal/kWh	/kWh	/k₩h
Demand	<u> </u>		∕k₩	/k₩

(2) Tend of Energy Consumption

Energy	Unit	1992	1993	1994	1995	1996	1997
							(Plan)
Coal	(t)						
Fuel Oil	<u>(kl)</u>						
Gas Oil	(k1)						****
Kerosene	(k1)						
LPG	(kg)						
Natural Gas	(m3)						
Electricity							
Total	(mWh)						
In-house	(mWh)						
Purchased	(mWh)						
					, ,		
Demand	(k₩)						

(3) Energy consumption for each plant/process in 1996 (or 1995)

(another sheet --page.5---)

2 (3) Energy consumption for each plant/process in	umption for	each pla	nt/process in	1996 (or 1995)					
Process	Production	ion	Electricity	Coal	Fuel oil	Gas oil	Kerosene	LPG	Natural gas
· · · ·	Product	Unit	- kwh	ton	kl	kl	kl	kg	• Nm3
Energy supply						***	*****		
(1)Air compresser									
(2) Boiler									
(3) generator						***************************************			
(4) 0thers									
(Sub-total)									
Casting									
(2) 0thers									
(Sub-total)	*****		-						
Forging									
Machining(include narts shon)									
Assembly	 								
Paint & Drving									
Others (office)									
							-		
Consumption total				- · · · · ·					
(1) In-house									
(2) Purchased							-		-

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المرجع بالمرجع المرجع الم

(4) Tend of Energy intensity by process

(Energy supply , Casting , Forging , Machining , Assembly , others)

د میرد در مم ا میرد از در اینده این از در این در این میرد و می و این این این می ایند. این در این در این می می

(4) - 1	Fnergy	supply	station	/shon
(1) 11	Duci 61	ouppij	oracion	/ onop

			1994	1995	1996
Product (*1)	Steam	ton	ton	ton	ton
Energy unit	Heat Valu	ie			
Coal (ton)		kcal/t	ton	ton	ton
Fueloil (kl)		kcal/kl	kl	kl	k l
Gasoil (kl)		kcal/kl	kl	ki	kl
Kerosene (kl)		kcal/kl	kl	kl	kl
LPG (kg)		kcal/kg	kg	kg	kg
Natural. (m3)		kcal/m3	m3	m3	m3
Elec. (m\h)	· · ·	cal/kWh	mWh	mWh	mWh
Total consum	ption(*2) (* k	cal)			
Energy intensity (*	2 / *1) (* k	cal/ton)			
(4)-2. Casting	· · · · · · · · · · · · · · · · · · ·	·			
			1994	1995	1996
Product (*1)		tón	toń	ton	ton
Energy unit	Heat Valu	1e			
Coal (ton)		kcal/t	ton	ton	ton
Fueloil (kl)		kcal/kl	kl	kl	kl
Gasoil (kl)		kcal/kl	kl	kl	kl
Kerosene (kl)		kcal/kl	kl:	kl	kl
LPG (kg)		kcal/kg	kg	kg.	kg
Natural. (m3)		kcal/m3	m3	m3	m3
Elec. (mWh)		kcal∕kWh	m¥h	mWh	mWh
Total consum	ption(*2) (* k	cal)			
Total consum Energy intensity (*		cal/ton)			

(4)-3. Forging

		1994	1995	1996
Product (*1)	ton	ton	ton.	ton
Energy unit	Heat Value			
Coal (ton)	kcal/t	ton	ton	ton
Fueloil (kl)	kcal/kl	kl	kl	kl
Gasoil (kl)	kcal/kl	kl	kl	kl
Kerosene (kl)	kcal/kl	kl	kl	kl
LPG (kg)	kcal/kg	kg	kg	kg
Natural. (m3)	kcal/m3	m3	m3	m3
Elec. (<u>mWh</u>)	kcal/kWh	mWh	m₩h	mWh
Total consum	otion(*2) (* kcal)			· · ·
Energy intensity (*	2 / *1) (* kcal/ton)			

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(4)-4.Machining

y - A de la grande de la construcción de la construcción de la construcción de la construcción de la deservación		1994	1995	1996
Product (#1)	ton	ton	ton	ton
Energy unit	Heat Value			
Coal (ton)	kcal/t	ton	ton	ton
Fueloil (kl)	kcal/kl	kl	kl	kl
Gasoil (kl)	kcal/kl	kl.	kl	kl
Kerosene (kl)	kcal/kl	kl	kl	kl
LPG (kg)	kcal/kg	kg	kg	· kg
Natural. (m3)	kcal/m3	m3	m3	m3
Elec. (mWh)	kcal/kWh	mWh	mWh	mWh
Total consumpti	on(*2) (• kcal)			
Energy intensity (*2)	/ *1) (* kcal/ton)			

(4)-5. Assembly

			1994	1995	1996
Product (*1)		ton	ton	ton	ton
Energy unit	Heat V	alue			
Coal (ton)		kcal/t	ton	ton	ton
Fuel oil (kl)		kcal/kl	kl	kl	kl
Gas oil (kl)		kcal/kl	kl	kl	kl.
Kerosene (kl)		kcal/kl	kl	kl	kl
LPG (kg)		kcal/kg	kg	kg	kg
Natural. (m3)		kcal/m3	m3	ш3	m3
Elec. (mWh)		kcal/kWh	mWh	mWh	mWh
Total consu	mption(*2) (* kcai)			
Energy intensity	(*2 / *1) (• kcal/ton)			

			1994	1995	1996
Product (*1)		ton	ton	ton	ton
Energy unit	Heat V	alue			
Coal (ton)		kcal/t	ton	ton	ton
Fuel oil (kl)		kcal/kl	kl	kl	kl
Gas oil (kl)		kcal/kl	kl	kl	kl
Kerosene (kl)		kcal/kl	k l	kl	kl
LPG (kg)		kcal/kg	kg	kg	kg
Natural. (m3)		kcal/m3	m3	m3	m3
Elec. (m\h)		kcal/kWh	mWh	mWh	mWl
Total consumpt	on(*2) (• kcal)			:

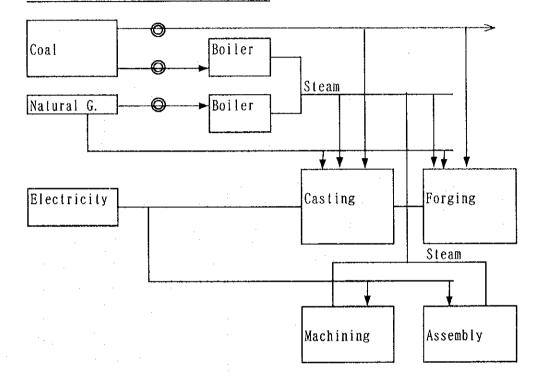
(5)Rate of energy cost for production cost in whole plant



(6) How much is the target rate of energy cost vs Production cost? :

(7) Energy supply flow diagram showing flow meter location like a following example

Example of energy supply fow diagram



	Name of process/line		Pressure	Max consumption (m3/min)
1		 		
2				
3		 ,		
4				
5		 		
6		 		· · · · · · · · · · · · · · · · · · ·
7				
8		 		
9		 		
10				<u> </u>

(8) Major equipment for Compressed Air consumption

(9) Major equipment for Steam consumption

No	Name of process/line	Name of equipment	Purpose to use	Pressure	Max consumption (ton/h)
1					
2					· · · ·
3					
4					
5					
- 6					
7	······································		· · · · · · · · · · · · · · · · · · ·		
8					
9					
10		-			

(10) Average temperature for the Office and plant

Season	Setting Temperature (Area)	
	(Area:)
	(Агеа:)
	(Area:)
	(Агеа:)
	(Агеа:)
	(Area:	

- 3. Production system
- 3-1. Casting (Melt and Mold)

Equipment	0 · • •		
	Specifi Type		
	Built year		
			ton/hour
ļ	Ratio of cokes(J-カス比)		X
	Cokes intensity(コークス原単位)		kg/ton
	Maximum inside dia. of the m (溶解帯最大炉内径)		សាល
	Melting Temperature (溶湯温度)		C
	Temp. of hot ventilation		C
	AmOunt of hot ventilation		Nm3/min
Cupola	Туре		
(2)	Built year	:	
(set)	Capacity		ton/hour
			X
	Cokes intensity(コークス原単位)		ka/ton
	Maximum inside dia. of the m (溶解帯最大炉内径)	elting zone	រោព
	Melting Temperature (溶湯温度)		C
	Temp. of hot ventilation		°C
· · · · · · · · · · · · · · · · · · ·	AmOunt of hot ventilation		Nm3/min
Heat insulation	Туре		
furnace	Built year		
(1)	Kind of energy	· · · · · · · · · · · · · · · · · · ·	
·	Frequency		Hz
	Capacity		
	Temperature(Target of furnace	temp.)	Ŷ
Heat insulation			
furnace	Built year		
(2)	Kind of energy		
	Frequency		Ŭa
· ·			Hz
	Capacity		

······································	ication of Casting process	
Equipment	Specifi	cation
	Туре	
(1)		
	Kind of energy	
	Rated output of driving motor	
		·····
Molding machine	Туре	
(2)	Built year	
	Kind of energy	
	Rated output of driving motor	KW
Core oven	Туре	
(1)	Built year	
	Temperature	
	Kind of energy	
Core oven	Туре	
(2)	Built year	
	Temperature	
	Kind of energy	
Shot blast	Туре	
(1)	Capacity	
	Built year	
	Rated output of motor	
	Rated output of dust collecto	
· ·		
Shot blast	Туре	
(2)	Capacity	
	Built year	
	· 1	
	Rated output of dust collecto	1

Main specification of Casting process

Main specification of Casting process

Equipment	Speci	ication
Annealing	Туре	
Furnace	Size	
(1)	Built year	
	Temperature	
	Kind of energy	
Annealing	Туре	
Furnace	Size	
(2)	Built year	
	Temperature	
	Kind of energy	
Drying furnace	Туре	
(1)	Size	
	Built year	
· ·	Temperature	
	Kind of energy	
Drwing furnage		
Drying furnace (2)	Type Size	
(2)		
· ·	Built year	
· ·	Temperature	
V	Kind of energy	
Another	parantanan makan maka	
:		
н. На		
· · ·		
-		

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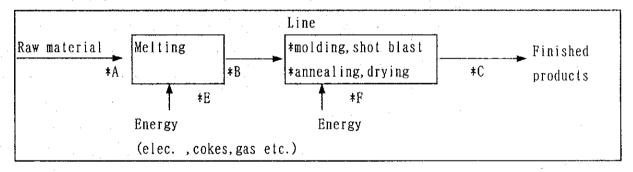
(2) Design and o Process	perational information(Item		Design	Acti	
	Productivity		t/hou'r		t/hour
	Ratio of cokes		*		%
	Cokes intensity		kg/ton		 kg∕ton
	Form of operation		h/day	·····	h/day
		(h/month)	(h/month)
	Molten volume			、 	1
Cupola (2)	Productivity		ton/year		<u>ton/year</u> t/hour
	Ratio of cokes		t/hour		
			¥		× %
	Cokes intensity Form of operation		kg/ton		kg/ton
		1	h/day	(h/day
	Malian valuma		h/month)		h/month)
TT	Molten volume				
Heat insulation			t/hour		t/hour
furnace					
(1)	Energy consumption		Mcal/ton		Mcal/ton
	Temperature		°C		°C
	Form of operation		h/day	,	h/day
· · · · · ·		(h/month)	(h/month)
Heat insulation			t/hour		t/hour
furnace	Kind of energy				
(2)	Energy consumption		Mcal/ton		Mcal/ton
	Temperature		°		°C
	Form of operation		h/day		h/day
	·	(h/month)	(h/month)
Molding machine	Productivity		t/hour		t/hour
	Kind of energy				
	Energy consumption		Mcal/ton		Mcal/ton
		(k₩h/t)	(kWh/t)
	Form of operation		h/day		h/day
		(h/month)	(h/month)
Core oven	Productivity		t/hour		t/hour
	Kind of energy				
	Energy consumption		Mcal/ton		Mcal/ton
	Temperature				
	Form of operation		h/day		h/day
		C			
L	<u> </u>	<u> </u>	h/month)	L`	h/month)

(2) Design and operational information (Typical equipment)

Process	Item		Design	Actua	1
Shot blast	Productivity		t/hour		t/hour
	Energy consumption		Mcal/ton		Mcal/ton
		(kWh∕t)	(k₩h/t)
	Form of operation		h/day		h/day
		(h/month)	(h/month)
Annealing	Productivity		t/hour		t/hour
furnace	Kind of energy				•
	Energy consumption		Mcal/ton		Mcal/ton
	Temperature				
	Form of operation		h/day		h/day
		(h/month)	(· · ·	h/month)
Drying furnace	Productivity	-	t/hour		t/hour
	Kind of energy Energy consumption				
	Energy consumption		Mcal/ton		Mcal/ton
н. Табратана Табратана	Temperature				
	Form of operation		h/day		h/day
		(h/month)	(h/month)

Design and operational information(Typical equipment)

(3) Whole operation



1. A ratio of melting metal for charged raw materials:
2. A ratio of finished products for casting metal:
3. Energy consumption rate for melting metal:
4. Energy consumption rate for all casting process:
5. Typical operation hours of casting process

6. Total products of casting per year

(*A/*B)=	about	%
(*B/*C)=	about	*
(*E/*A) =		Mcal/ton
(*E+*F)/*C=		Mcal/ton
	hou	rs/day
(hou	irs/month)
	tor	/year

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3-2.Forging

Typical system (Materia		orging		· · · · · · · · · · · · · · · · · · ·	
	>	Cutting Heat	ing ->	Press	—> [îrimming
(1) Main specif	ical	ion of Casting proces	s (Major equ	ipment for e	energy consumpti
Equipment			cification		····
Cutting machine	(1)	Туре			
hearing machine		Built year			
(over 30 KW)		Motor power			KW
	(2)	Туре			
		Built year			
		Motor power			KW
	(3)	Туре			
		Built year			·
		Motor power		****	K₩
Heating furnace	(1)	Туре			
		Built year		••••••	
		Capacity			:
		Kind of energy	*******	***************************************	
		Temperature			\$
	(2)	Туре		· · ·	<u> </u>
		Built year			
		Capacity			
		Kind of energy			
					200
Drang /	(1)	Temperature Type			<u> </u>
Press / Air hammer					
					ton
		Maton noisen		· · · · ·	
		Motor power Kind of energy			KW
	(2)			n an	<u>, and and a standard second</u>
	(2)	0 11			
		Built year			LON
		Notor power			T7117
		1			KW
	1	Kind of energy			<u> </u>

Equipment		Specification	
Press /	(3)	Туре	
Air hammer		Capacity	ton
		Built year	
		Motor power	KW
		Kind of energy	
	(4)	Туре	
		Capacity	ton
		Built year	
		Motor power	KW
		Kind of energy	
Trimming	(1)	Туре	
		Built year	
		Motor power	KW
	(2)	Туре	
-		Built year	
· · · · · · · · · · · · · · · · · · ·		Motor power	KW
Another		Name of equipment	
		Туре	
		Capacity	· · · · · · · · · · · · · · · · · · ·
		Built year	
• •		Motor power	

(2) Design and operational information Forging line(Typical equipment)

Process	Item		Design	Actual
Cutting machine	Form of operation		h/day	h/day
Shearing machine		(h∕month)	(h/month
(over 30 KW)				
Heating furnace	Productivity			
(Ì)	Temperature			
	Kind of energy	ľ		
	Energy consumption			
	Form of operation		h/day	h/day
		()	h/month)	(h/month
		I		

Design and c	perational information For		ipment)
Process	Item	Design	Actual
Heating furnace	Productivity	t/hour	t/hour
(2)	Temperature	°C	C
	Kind of energy		
	Energy consumption	/ton	/ton
	Form of operation	h/day	h/day
		(h/month)	(h/month)
Press /	Productivity		
Air hammer	Energy consumption	/ton	/ton
(1)	Form of operation	h/day	h/day
		(h/month)	(h/month)
Press /	Productivity		
Air hammer	Energy consumption	/ton	/tor
(2)	Form of operation	h/day	h/day
		(h/month)	(h/month)
Press /	Productivity		
Air hammer	Energy consumption	/ton	/tor
(3)	Form of operation	h/day	h/day
		(h/month)	(<u>h/month</u>)
Press /	Productivity	ton/hour	ton/hou
Air hammer	Energy consumption	/ton	/to
(4)	Form of operation	h/day	h/day
	· · · · · · · · · · · · · · · · · · ·	(h/month)	(<u>h/month</u>)
Trimming	Productivity	ton/hour	ton/hou
	Energy consumption	/ton	/to
	Form of operation	h/day	h/day
		(h/month)	(h/month

Design and operational information Forging line(Typical equipment)

(3) Whole operation

(e) ofference of the second seco		and the second
1.A ratio of finished products for forging materials:	about	Х
(output / input)		
2. Energy consumption rate for all Forging process:	about	Mcal/ton
3. Typical operation hours of Forging process		hours/day
	(hours/month)
4. Total products of casting per year		ton/year

3-3. Machining (1) Main specification and operating formation of major Equipments for energy consumption at Machining process

Kind		•	Main specification			Form of	of operation		-
of Energy	NO Name of	of equipment	Specifi	ication	Iiem	D -	Design		Actual
Electricity	1		Motor power	K₩	Form of operation	-	h/day		h/day
(Except heat					Rate of operation	about	ж	about	96
treatment	2		Motor power	КХ	Form of operation		h/day		h/day
equipment)					Rate of operation	about	ጽ	about	96
	3	· · ·	Motor power	КW	Form of operation		h/day		ħ/day
	· ·				Rate of operation	about	સ્ટ	about	86
	4		Motor power	KW	Form of operation		h/day		h/day
					Rate of operation	about	ጽ	about	96
	2		Motor power	Κ₩	Form of operation		h/day		h/day
				-	Rate of operation	about	96	about	96
	9		Motor power	ΚW	Form of operation		h/day		h/day
	- - -				Rate of operation	about	ઝર	about	96
Fuel and gas	1 Wash	Washing machine	Pump motor power	KΨ	Form of operation		h/day		h/day
•	-		Temp. of liquid	S	Rate of operation.	about	ж	about	96
	2 Wash	Washing machine	Pump motor power	ΚW	Form of operation		h/day		h/day
			Temp. of liquid	С С	Rate of operation	about	8 6	about	96
	3 Washing	ing machine	Pump motor power	KW	Form of operation		h/day		h/day
			Temp. of liquid	С С	Rate of operation	about	۶۴	about	96
	4 Washing	ing machine	Pump motor power	ΚW	Form of operation		h/day		h/day
			Temp. of liquid	С,	Rate of operation	about	8	about	96
	5 Washing	ing machine	Pump motor power	ΚM	Form of operation		h/day		h/day
			Temp. of liquid	ç	Rate of operation	about	સ્લ	about	96
	6 Wash	6 Washing machine	Pump motor power	K₩	Form of operation		ħ/day		h/day
			Town of Louid	۶	Rate of oneration	ahout	è	2 h 0 1 f	2

Main specification and operating formation of major Equipments for energy consumption at Machining process

101 CHEIGA COHOMIPTION at Machine	Form of operation	cation Item Design Actual	KW Form of operation h/day h/day	Hz Rate of operation about % about %	KW Form of operation h/day h/day	Hz Rate of operation about % about %	KW Form of operation h/day h/day	Hz Rate of operation about % about %	Form of operation h/day h/day	C Rate of operation about % about %	Form of operation h/day h/day	C Rate of operation about % about %	Form of operation h/day h/day	C Rate of operation about % about %	Form of operation h/day h/day	m3/min Rate of operation about % about %	Form of operation h/day h/day	m4/min Rate of operation about % about %	Form of operation h/day h/day	m5/min Rate of operation about % about %	Form of operation h/day h/day	m6/min Rate of operation about % about %	Form of operation h/day h/day	
Equipments for chergy	specification	Specification Item	KW Form of	Rate of	KW Form of	ncy Hz Rate of	KW Form of	Rate of	of	Rate	0 I O	Rate of	of	Rate of	of	Rate	of	Rate of	of	Rate of	of	sumption m6/min Rate of	of	
Main specification and operating formation of major	Main spe	NO Name of equipment	I Induction hardening Ppower	•	rdening		3 Induction hardening Ppower	machine Free	ace		2 Heating furnace Kin		3 Heating furnace Kin		1 Air blow machine Pre	•	ne	after washing	3 Air blow machine Pre	1	ne		5 Air blow machine Pre	
Main specific	Kind	of Energy	Flectricity						Fuel or gas		V-	9-3-	26		Compressed	Ajr								

3-3. Assembly(1) Main specification and operating formation of major Equipments for energy consumption at assembly line

	אטעכ ווושעון	01110		(I) MAIN SUCCITICATION AND OPERATING TOTMALION OF MAJOL PHATEMENTS TOT	יו כווואות לחוק לחן	JI CHULEY CONSUMPTION		2111		
X	Kind	 		Main specification			Form of operation	eration		
	of Energy	NO N	Name of equipment	Specifi	ication	Item	Design		A	Actual
[m	Electricity		1 Assembly conveyor	Motor power	KW .	Form of operation	ų	h/day		h/day
			for			Rate of operation	about %		about	86
			2 Assembly conveyor	Motor power	К₩	Form of operation	h	h/day		h/day
		-	for			Rate of operation	about %		about	9€
			8	Motor power	KW	Form of operation	q	h/day		'n/day
						Rate of operation	about %		about	₩
. .			4	Motor power	КW	Form of operation	ų	h/day		h/day
V-9						Rate of operation	about %	20	about	સ્લ
9-3-2			2	Motor power	KW	Form of operation	ų	h/day		h/day
7	·					Rate of operation	about %		about	સ્લ
			6	Motor power	КŴ	Form of operation	ų	h/day		h/day
						Rate of operation	about %		about	કર
Ц	Fuel and gas		l Washing machine	Pump motor power	КЧ	Form of operation	ų	h/day		h/day
<u> </u>	·			Temp. of liquid	C	Rate of operation	about %		about	સ્ટ
			2 Washing machine	Pump motor power	КŴ	Form of operation	ų	h/day		h/day
		·		Temp. of liquid	C	Rate of operation	about %		about	ઝલ
ت	Compressed		l Air blow machine	Pressure		Form of operation	щ	h/day		h/day
	Air		after washing	Max. consumption	m3/min	Rate of operation	about %	ý	about	%
	•		2 Air blow machine	Pressure		Form of operation	Ч	h/day		h/day
			after washing	Max. consumption	m4/min	Rate of operation	about %		about	કર
J										

,f Βυς≖ααι	Mai	Main specification			Form of operation	
I DICIEJSY	NO Name of equipment	Spec	Specification	Item	Design	Actual
Electricity	1 Electric nut runner	Motor power	КŴ	Form of operation	h/day	h/day
	(Electric driver)	Max. torque				
	2 Electric nut runner		КЖ	Form of operation	h/day	h/day
	(Electric driver)	Max. torque				
	3 Electric nut runner		КŴ	Form of operation	h/day	'n/day
	(Electric driver)	Max. torque				
Compressed	Air nut runner	0		Form of operation	h/day	h/day
Air	(Air driver)	Max. torque				
	9 Air nut runner	Pressure		Form of operation	h/day	h/day
	- (Air driver)	Max. torque				
	3 Air nut runner	Pressure		Form of operation	h/day_	h/day
	(Air driver)	Max. torque				
		1				
		· .	•			
				-		

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3-4. Painting and Drying

min/unit min/unit units/day h/day min/unit min/unit units/day units/day h/day units/day h/day h/day Actual (1) Main specification and operating formation of major Equipments for energy consumption atPainting & Drying units/day uni Is/day units/day units/day min/unit min/unit min/unit min/unit Form of operation h/day h/day h/day h/day Design Form of operation Form of operation productivity Form of operation Form of operation **fypical products** ypical products Drying time/unit **Typical products** Drying time/unit Typical product Kind of paints Kind of paints Painting time Painting time productivity productivity productivity Item Specification Main specification Temp. of hot wind Temp. of hot wind Kind of energy Kind of energy power(lump) power(lump) Type Type Name of equipment 1|Drying furnace 2|Drying furnace l|Paint booth 2 Paint booth 3 Ξ 0N of Energy Kind V-9-3-29

4.	Energy	Management	ŀ
----	--------	------------	---

(1)	Energy	conservati	ion	strategy	and	larget	
-----	--------	------------	-----	----------	-----	--------	--

					·····	
2)	How do	you fo	llow about it ?			
3)	Energy	conserv	vation promotion c	organization		
	,					
		·····				
.)	Activi	ty of e	nergy conservation	ı committee		
					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
)	The gr	oup tha	t execute mainly e	energy conservation	activity	
3)	System	of col	lect the idea for			*****
			reet the rucu for	improvement and est	imating system	
				Improvement and est	imating system	
				Improvement and est	inmating system	
7)		ment fo	r energy conserva	tion in the past		1
')	Invest Year	ment fo			Expectation of effect	Results
7)		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of	Expectation	Results
7)		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of	Expectation	Results
() ()		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of	Expectation	Results
· · · · · · · · · · · · · · · · · · ·		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of	Expectation	Results
0		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of	Expectation of effect	
7)		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of investment	Expectation of effect	
7)		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of investment	Expectation of effect	
7)		ment fo	<u>r energy conserva</u> Contents of	tion in the past Cost of investment	Expectation of effect	

(8) Energy conservation activity

Please mark applicable ones.

Example:	(A)	=Operating/Installed
	(B)	=Not perfect but operating as a role
		/Under construction
	(C)	=Not operating/Under planning

			Ŧ	
NO	[tems	Annli	cation	Year of
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	avoiding heat loss		~~~~~	
22) .	
	Enforce the insulation of steam pipe			
	2 3 4 5 6 7 8 9 10 11 11 12 13 14 15 16 17 18 19 20 21 22	 Awareness of energy conservation to employee Education of correct operating method to employee Collecting system of idea for improvement and estimating system Operation in low electricity rate such as night and holiday Shift of operating time and working day in order to use energy efectively To turn off electricity when no one is in the office To turn off the power of an equipment that is not used for hours Control the temperature for a heater Cleaning the electric appliances (Cycle = years) Light-on & light-off by actual bright (Outside lighting) To use a efficiency light Reduction of compressed air pressure Pressure control of steam Recovery steam drain Control of power factor To reduce a pressure loss of pipe Local supply of compressed air by booster Suitable supply by number control of small compresser To stop the compresser in plant holiday To repair of broken windows and doors for avoiding heat loss To stop a few leak of compressed air even if it is no problem for production 	1 Awareness of energy conservation to employee (2 Education of correct operating method (to employee 3 Collecting system of idea for improvement (and estimating system 4 Operation in low electricity rate such as night and holiday (5 Shift of operating time and working day (in order to use energy efectively ((6 To turn off electricity when no one is (in the office ((7 To turn off the power of an equipment (that is not used for hours ((8 Control the temperature for a heater ((9 Cleaning the electric appliances (cycle = years) ((10 Light-on & light-off by actual bright (cutside lighting) ((11 To use a efficiency light ((12 Reduction of compreesed air pressure ((13 Pressure control of steam ((14 Pressure control of steam ((15 Recovery steam drain ((16 Control of power factor ((<td>1 Awareness of energy conservation to employee () 2 Education of correct operating method () to employee 3 Collecting system of idea for improvement () and estimating system ()) 4 Operation in low electricity rate such as () night and holiday ()) 5 Shift of operating time and working day () in order to use energy efectively ()) 6 To turn off electricity when no one is () in the office ())) 7 To turn off the power of an equipment () ithat is not used for hours ()) 8 Control the temperature for a heater () 9 Cleaning the electric appliances () (Cycle = years))) (Outside lighting) 10 Light-on & light-off by actual bright () (Outside lighting)))) 11 To use a efficiency light () 12 Reduction of compreesed air pressure ()</td>	1 Awareness of energy conservation to employee () 2 Education of correct operating method () to employee 3 Collecting system of idea for improvement () and estimating system ()) 4 Operation in low electricity rate such as () night and holiday ()) 5 Shift of operating time and working day () in order to use energy efectively ()) 6 To turn off electricity when no one is () in the office ())) 7 To turn off the power of an equipment () ithat is not used for hours ()) 8 Control the temperature for a heater () 9 Cleaning the electric appliances () (Cycle = years))) (Outside lighting) 10 Light-on & light-off by actual bright () (Outside lighting)))) 11 To use a efficiency light () 12 Reduction of compreesed air pressure ()

Process	NO.	Items	Application	Year of application
asting		Improvement of energy consumption rate of	()	
		melting(ton)		
			() ()	
		To reduce the idling time of machine	()	****
		To avoid cold air invasion in treatment furnace		
		(Cupola)Pre-heating of blast by exhaust gas	()	, , , , , , , , , , , , , , , , , , ,
		(Cupola)Long and continuous operation		
		(Cupola)Oxygen enrichment in blast		
		To control the r.p.m of dust collector	()	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
		Stop of dust collector during stop of	()	
		production line		
		Enforcement the insulation of furnace		
	34	Concentrated control the accumulators of		
		hydraulic system		
		(to combine several accumulator)		
		(Shot blast)Minimum time of shot blast		
·	36	(Shot blast)To control a suitable shot time		
		by work		
	37	To reduce the idling time of sand treatment		
		equipment at a lunch break		
	38	Recirculation of cooling water	<u> ()</u>	
	39	To control a suitable blow time for molding	()	
	40	To reduce the idling time of grind motor		
	<u> </u>	for casting		
Forging	41	To reduce the idling time of machine	()	
	42	To reduce the allowance by improvement of material		
	43	To avoid cold air invasion in heating	()	
		furnace		
·	44	To avoid cold air invasion in heating	()	
		furnace		
	45	Simple arrangements toreduce preparation	()	
:		time at line changing		
Machining	46	To reduce the idling time of machine		
Machining	1	To address the worm in time	()	
		Use the function of one cycle stop"	(
			1	
		Operation Machinning Pause Machinning		
		Hydrauric Pump	One cycle	e stop
		Drive Pause Drive		
		Drive	Non s	top

Process	NO.	Items	Appl	ication	Year of application
(machining)	49	Simplify the machining process	()	
		(no milling, drilling)			
	50	To reduce the amount of machining	()	
		(To reduce the machining time)			
	51	To reduce the failure of machining	()	
	<u>ເ</u> ຈ	(To reduce the energy of remake) To combine several machining process with			
	94	multiple equipment to reduce		,	
		the number of equipment.			
	53	Control the temperature of washing liquid	(Y	
		Air blow after washing only during	·····)	
		the product is there.		,	
Assembly	55	To reduce the idling time of machine	()	
	56	To reduce the warm-up time	()	
		Use the function of one cycle stop"	()	
		(refer NO.49)			
	58	To reduce the assembly process	()	
•	59	To reduce the assembly time(speed up)	()	
:	60	To reduce thefailure of machining	()	
Painting		To avoid cold air invasion in drving furnace	(.)	
and	62	To use quick dry type paint	()	
Drying	63	To reduce a thickness of coating	· · ()	
Another		improvement the power factor of large sized	()	
		motor			
·	65	Concentrated production	()	
		(close the factory during no product)			
	66	Improvement of quality(reduction of failure)	()	
· · · ·	67	Replacement of old pump with high efficiency	()	
t e e	· .				

Check List for Process of Truck Production

		Date	
		Surveyor	
General	information		
(1) Factory	name		
	Company name: Starachowice	company "STAR"	
(2) Adress	Factory:		
	Head Office :	· · · · · · · · · · · · · · · · · · ·	
(3) Numbers	of Employees		
(4)Main Pro	ducts and production capacity		· · · · · · · · · · · · · · · · · · ·
	Name of Unit	Production	Start-up
		Capacity	year
(a)			
(b)			
(c)			
(d)			
(e)			

Products	1992	1993	1994	1995	1996	1997	2000
			1. j.			(Plan)	(Plan)
(a)							
(b)							
(c)							
(d)							4 (4) 10 10 10 10 10 10 10 10 10 10 10 10 10
(e)							

(6) History of the plant

(Foundation and expansion the plant, rebuild, new production system share in the Industry, History of production etc.)

Foundation:

......

History of expantion

Share of products in Poland

(6) Outline of Production Processes (Process Flow Sheet) Next page

.

(7) Factory and Plant Layout

Please separately prepare.

Drying Cylinder-block, Ccylinder-head Painting Example Fuel-pump, Starter Connecting-rod Bracket Counter weight Crank-shaft Testing Tractor Assembly Drying ***** (5) Painting Name of product/parts Engine-Testing ***** (4) Engine-Ass'y Purchased ***** (3) 6. Out-line of production process Example Machining *****(2) Casting *(1) Forging () * *****(2) *****(3) (†) N0

Tire/wheel

***** (5)

2. Transition of Energy Consumption

(1)Unit Price of Energy(1995-1996)

	Heat val	ue	Unit pric	e
Energy	Heat value	Unit	1995	1996
Coal		kcal/t	/1	/t
Fuel Oil		kcal/kl	/k1	<u>/kl</u>
Gas Oil	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	kcal/kl	/k1	/kl
Kerosene		kcaľ/kl	/k1	/k1
LPG		kcal/kg	/kg	/kg
Natural Gas		kcal/m3	/n3	<u>/m3</u>
Electricity				
In-house		kcal/kWh	/k\h	/k\%h
Purchased	1414	kcal/kWh	∕k₩h	/k\#h
********		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Demand	· · · · · · · · · · · · · · · · · · ·		/k₩	∕k₩

(2) Tend of Energy Consumption

Energy	Unit	1992	1993	1994	1995	1996	1997
					L		(Plan)
Coal	(t)						
Fuel Oil	(k1)						
Gas Oil	(k1)						
Kerosene	(k1)						
LPG	(kg)	****					
Natural Gas	(m3)						
Electricity					1		
Total	(mWh)						
In-house	(mWh)						
Purchased	(mWh)	******		_			
***.							
Demand	(k₩)						

(3) Energy consumption for each plant/process in 1996(or 1995)

(another sheet --page. 5--)

Process Production Electricit	Production	ion	Electricity	Coal	Fuel oil	Gas oil	Kerosene	DGT	Natural gas
	Produc1	Unit	- kwh	ton	kl	kl	kl	kg	• Nm3
Energy supply									
(1) Air compresser									
(2) Boiler									
(3) generator									
(4) 0thers									
(Sub-total)									
Casting									
(1) Melting									
(2)0thers									
(Sub-total)									
Forging							-		
Machining(include parts shon)		ļ ,							
Assembly									
Paint & Drving									
Others(office)									
Consumption total									
(1) In-house									
(2) Purchased									

(4) Tend of Energy intensity by process

(Energy supply , Casting , Forging , Machining , Assembly , others)

(4)-1.	Energy	supply	y static	on /shop

				1994	1995	1996
Product (*1)		Steam	ton	ton	ton	ton
Energy un	i t	Heat Va	lue			
<u>Coal (</u>	ton)		kcal/t	ton	ton	ton
Fuel oil	(k1)		kcal/kl	<u>k1</u>	kI	kl
<u>Gas oil</u>	(k1)		kcal/kl	<u>k1</u>	kl	<u>k l</u>
Kerosene	(k1)		kcal/kl	k l	kl	kl
LPG	(kg)		kcal/kg	kg	kg	kg
Natural.	(m3)		kcal/m3	т3	m3	m3
Elec. (m\h)		kcal/kWh	mWh	տ\%h	mWh
Total o	consum	ption(*2) (•	kcal)			
Energy intens	itý (*	2 / *1) (*	kcal/ton)			

·····

(4)-2.Casting

		· · · · · · · · · · · · · · · · · · ·	1994	1995	1996
Product (#1)	ton	ton	ton	ton
Energy	unit	Heat Value			
Coal	(ton)	kcal/t	ton	ton	ton
Fúel oi	1 (k1)	kcal/kl	kl	kl	kl
Gas oil	(kl)	kcal/kl	kl	kl	kl
Kerosen	e (kl)	kcal/kl	kl	kl	kl
LPG	(kg)	kcal/kg	kg	- kg	kg
Natural	. (m3)	kcal/m3	m3	ш3	<u> </u>
Elec.	(m\h)	kcal/k\h	mWh	mWh	mWh
Tol	al consump	tion(*2) (* kcal)			
Energy int	tensity (*2	/ *1) (* kcal/ton)		

(4)-3. Forging

· · · · · · · · · · · · · · · · · · ·		1994	1995	1996
Product (*1)	ton	ton	ton	ton
Energy unit	Heat Value			· .
Coal (ton)	kcal/t	ton	ton	ton
Fueloil (kl)	kcal/kl	k1	kl	kl
Gasoil (kl)	kcal/kl	kl	kl	kl
Kerosene (kl)	kcal/kl	kl	kl	kl
LPG (kg)	kcal/kg	kg	kg	kg
Natural. (m3)	kcal/m3	m3	m3	m3
Elec. (m\h)	kcal/k\h	m¥h	. m¥h	መሦስ
Total consumpl	ion(*2) (* kcal)			
Energy intensity (*2	/ *1) (* kcal/ton)			

(4)<u>-4.Machining</u>

		1994	1995	1996
Product (*1)	ton	ton	ton	ton
Energy unit	Heat Value			
<u>Coal</u> (ton)	kcal/t	ton	ton	ton
Fueloil (kl)	kcal/kl	kl	kl	kl
Gasoil (kl)	kcal/kl	kl	kl	kl
Kerosene (kl)	kcal/kl	kl	kl	kl
LPG (kg)	kcal/kg	kg	kg	kg
Natural. (m3)	kcal/m3	m3	m3	m3
Elec. (mWh)	kcal/kWh	mWh	m₩h	nWt
Total consump	tion(*2) (* kcal)			
Energy intensity (*2	/ *1) (* kcal/ton)			

(4) -5. Assembly

		1994	1995	1996
Product (¥1)	ton	ton	ton	ton
Energy unit	Heat Value			• . •
Coal (ton)	kcal/t	lon	ton	ton
Fueloil (kl)	kcal/k1	kl i	kl	<u>k l</u>
Gasoil (kl)	kcal/kl	<u>k1</u>	kl	kl
Kerosene (kl)	kcal/kl	kl	<u>kl</u>	kl
LPG (kg)	kcal/kg	kg	kg	kg
Natural. (m3)	kcal/m3	m3	<u>m3</u>	m3
Elec. (mWh)	kcal/kWh	mWh	_ mWh	mWh
Total consumpti	on(‡2)(* kcal)			
Energy intensity (#2 /	' *1) (• kcal/ton)			1944 - 1945 1947 - 1947 1947 - 1947 - 1947

(4) <u>-6. (</u>

			1994	1995	199	96
Product (*1)		ton	ton	ton		ton
Energy unit	Heat Va	lue				
Coal (ton)		kcal/t	ton	ton		ton
Fueloil (kl)		kcal/kl	kl	kl		kl
Gasoil (kl)	. • .	kcal/kl	kl	kl		kl
Kerosene (kl)		kcal/kl	kl	kl		kl
LPG (kg)		kcal/kg	kg	kg		kg
Natural. (m3)		kcal/m3	m3`	m3		m3
Elec. (mWh)		kcal/kWh	mWh	ወሦክ		m₩h
Total consump	tion(*2) (•	kcal)				
Energy intensity (*2	! / *1) (**	kcal/ton)			:	

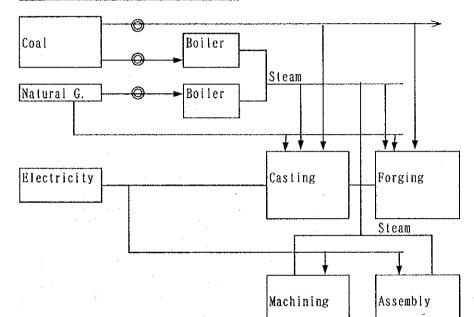
(5) Rate of energy cost for production cost in whole plant

Energy cost	×	
Production cost	×	

? : %

(6) How much is the target rate of energy cost vs Production cost? :_____

(7) Energy supply flow diagram showing flow meter location like a following example



Example of energy supply fow diagram

Majo No	Name of p	process/line	Name of	equipmen	Purpose	to	use	Pressure	Max co (m:	nsumption 3/min)
1					,,,,					
2					*** ** ***					••••••
3	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	41611 16171 41 15) 5 ÷ 6 [• 4] (6 / 5 • 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1		· · · · · ·			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
4								,		
5		-,							-1+)-1+7	
7									••••••••••••	
8 Q										
<u>9</u> 10			· · · · · ·	······		••••••	•••••			

(8) Major equipment for Compressed Air consumption

(9) Major equipment for Steam consumption

No	Name of	process/line	Name c	f equipmen	Purpose	to use	Pressure	Max consumption (ton/h)
1		· · · ·						
2						:		
3								
4	ļ		i i					
5								
6					1		1 . · ·	
7							· ·	
8								
9					1	1		
10)							

(10) Average temperature for the Office and plant

Season	Setting Temperature (Area)
	(Агеа:)
	(Area:)
	(Area:)
	(Area:
	(Area:)
	(Area:)

3. Production system

3-1. Casting (Melt and Mold)

Main specifica	tion of Casting process (Maj	or equipment for energy consumption)
Equipment	Specifi	cation
Cupola	Туре	
(1)	Built year	
(set)	Capacity	ton/hour
	Ratio of cokes(コークス比)	*
	Cokes intensity(コークス原単位)	kg/ton
	Maximum inside dia. of the m (溶解帯最大炉内径)	elting zone mm
	Melting Temperature (溶湯温度)	C
	Temp. of hot ventilation	C
	AmOunt of hot ventilation	Nm3/min
Cupola	Туре	
(2)	Built year	
(set)	Canacity	ton/hour
	Ratio of cokes (J-カス比)	*
	Cokes intensity(J-クス原単位)	kg/ton
н. - С С С С С С С С	Maximum inside dia. of the m (溶解带最大炉内径)	elting zone
	Melting Temperature (溶湯温度)	°.
	Temp. of hot ventilation	C
	AmOunt of hot ventilation	Nm3/min
Heat insulation	Туре	
furnace	Built year	
(1)	Kind of energy	
	Frequency	Hz
	Capacity	
	Temperature(Target of furnace	temp.) °C
Heat insulation	Туре	l
furnace	Built year	· · ·
(2)	Kind of energy	
	Frequency	
	Capacity	Hz
	Temperature(Target of furnace	temp.)

(1) Main specification of Casting process (Major equipment for energy consumption)

Equipment	Specifica	tion
olding machine	Туре	
(1)	Built year	
	Kind of energy	
	Rated output of driving motor	KW
Molding machine	Туре	
(2)	Built year	
	Kind of energy	·
	Rated output of driving motor	KW
		· · · · · · · · · · · · · · · · · · ·
Core oven	Туре	
(1)	Built year	
	Temperalure	
	Kind of energy	
· · · · · · · · · · · · · · · · · · ·		· · · ·
Core oven	Туре	
(2)	Built year	
	Temperature	
	Kind of energy	
		· · · · · · · · · · · · · · · · · · ·
Shot blast	Туре	
(1)	Capacity	
	Built year	
	Rated output of motor	
	Rated output of dust collector	****
Shot blast	Туре	
(2)	Capacity	
. (4)		
	1 · · · · · · · · · · · · · · · · · · ·	
	Rated output of dust collector	

j spectri	fication				
Туре					
Size					
Built year					
Temperalure					
Kind of energy					
Туре					
Size					
Built year					
Temperature					
Kind of energy					
Туре					
Size					
Built year					

Ruilt vear					
· · · · · · · · · · · · · · · · · · ·					
	Type Size Built year Temperature Kind of energy Type Size Built year Temperature Kind of energy Type Size Built year Temperature Kind of energy Type Size Built year Temperature Kind of energy				

Main specification of Casting process

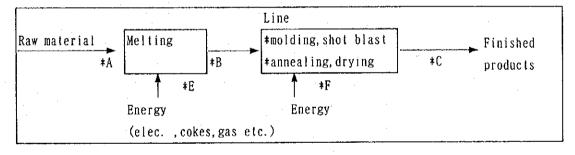
(2)	Design	and	operational	information(Typical equipmen	1)

Process	tional information(Typi Item		Design	Actual		
Cupola (1)	Productivity		t/hour		t/hour	
	Ratio of cokes		¥		¥	
	Cokes intensily		kg/ton		kg/ton	
	Form of operation		h/day		h/day	
			h/month)	(h/month)	
	Molten volume		ton/year		ton/year	
Cupola (2)	Productivity		t/hour	.,,	t/hour	
	Ratio of cokes		*		x	
	Cokes intensity		kg/ton		kg/ton	
	Form of operation		h/day		h/day	
÷		(h/month)	(h/month)	
	Molten volume			<u>.</u>		
Heat insulation	Productivity		t/hour		t/hour	
furnace	Kind of energy					
(1)	Energy consumption		Mcal/ton		Mcal/to	
	Temperature		°C		Ĉ	
	Form of operation		h/day		h/day	
		(h/month)	(h/month)	
Heat insulation	Productivity		t/hour		t/hour	
furnace	Kind of energy					
(2)	Energy consumption		Mcal/ton		Mcal/to	
	Temperature		C		C	
	Form of operation		h/day		h/day	
		(h/month)	(h/month	
Molding machine	Productivity		t/hour		t/hour	
	Kind of energy					
	Energy consumption		Mcal/ton		Mcal/to	
	E.	(k\h/t)	(k₩h/t)	
	Form of operation		h/day		h/day	
		(h/month)	(<u>h/month</u>	
Core oven	Productivity		t/hour	[t/hour	
	Kind of energy			[
	Energy consumption		Mcal/ton		Mcal/to	
	Temperature					
	Form of operation		h/day	1	h/day	
		(h/month)	c	h/montl	

Design and oper	ational information(Typic	<u>al equ</u>	(pment)		
Process	Item		Design	Ac	tual
Shot blast	Productivity		t/hour		t/hour
	Energy consumption		Mcal/ton		Mcal/to
		(k₩h/t)	(k₩h/t)
	Form of operation		h/day		h/day
		(h/month)	(h/month
Annealing	Productivity		t/hour		t/hour
furnace	Kind of energy				
	Energy consumption		Mcal/ton		Mcal/to
	Temperature				
	Form of operation		h/day		h/day
		(h/month)	(.	h/month
Drying furnace	Productivity		t/hour		t/hour
	Kind of energy				
			Mcal/ton		Mcal/to
	Temperature				
·	Form of operation		h/day		h/day
		(h∕month)	(h∕month

Design and operational information(Typical equipment)

(3) Whole operation



6.Total products of casting per year		ton/	'year
	(hour	∙s/month)
5. Typical operation hours of casting process		hour	∙s∕day
4.Energy consumption rate for all casting process:	(*E+*F)/*C=		Mcal/ton
3. Energy consumption rate for melting metal:	(*E/*A) =		Mcal/ton
2.A ratio of finished products for casting metal:	(*B/*C)=	about	X
1.A ratio of melting metal for charged raw materials:	(*A/*B)=	about	×

3-2. Forging

'ypical system of F Material	orgi	ng	1	
>	Cut	ting> Heating	Press >	Trimming
) Main specificat	ion	of Casting process (Ma	jor equipment for ener	gy consumption)
Equipment			ication	
Cutting machine	(1)	Туре		
Shearing machine		Built year		
(over 30 KW)		Motor power		KW
	(2)	Туре		
		Built year		
		Motor power		KW
	(3)	Туре		
		Built year	· · · · · · · · · · · · · · · · · · ·	
		Motor power	******	
Heating furnace	(1)	Туре		
		Built year		
		Capacity		
		Kind of energy		
		Temperature		٣
	(2)	Туре		
		Built year		
		Capacity		
		Kind of energy		
		Temperature		C
Press /	(1)	Type		
Air hammer		Conceity		ton
		Ruilt vear		¢ on
		Motor power		K¥
		Kind of energy		
	(2)	Туре		· · · · · · · · · · · · · · · · · · ·
		Capacity		ton
		Built year		
		Motor power		K¥
		Kind of energy		

Equipment		Specification	
Press /	(3)	Туре	
Air hammer		Capacily	lon
		Built year	
		Motor power	KW
		Kind of energy	
	(4)	Туре	
		Capacity	ton
		Built year	
		Motor power	KW
		Kind of energy	
Trimming	(1)	Туре	
		Built year	
		Motor power	KW
	(2)	Туре	
		Built year	
		Motor power	KW
Another		Name of equipment	
		Туре	
· .		Capacity	
. · · ·		Built year	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
		Motor power	

(2) Design and operational information Forging line(Typical equipment)

Process	Item		Design	Actual
Cutting machine	Form of operation		h/day	h/day
Shearing machine		(h/month)	(<u>h/month</u>)
(over 30 KW)				
Heating furnace	Productivity			
(1)	Temperature			
	Kind of energy			
	Energy consumption			
	Form of operation		h/day	h/day
			h/month)	(h/month)

Process	Item		Design	Actual
Heating furnace	Productivity		t/hour	t/hour
(2)	Temperature			Ĉ
	Kind of energy			
	Energy consumption		/ton	/ton
	Form of operation		h/day	h/day
		(h/month) (h/month)
Press /	Productivity			
Air hammer	Energy consumption			/ton
(1)	Form of operation		h/day	h/day
		(h/month) (h/month)
Press /	Productivity			
Air hammer	Energy consumption			/ton
(2)	Form of operation	1	h/day	ħ/day
		(h/month) (h/month)
Press /	Productivity			
Air hammer	Energy consumption		/ton	/tor
(3)	Form of operation		h/day	h/day
		(h/month) (h/month)
Press /	Productivity		t on/hour	ton/hou
Air hammer	Energy consumption		/ton	/toi
(4)	Form of operation		h/day	h/day
		(h/month) (h/month)
Trimming	Productivity		ton/hour	ton/hou
	Energy consumption		/ton	/to:
	Form of operation		h/day	h/day
		(h/month) (h/month)

Design and operational information Forging line(Typical equipment)

(3) Whole operation

1.A ratio of finished products for forging materials:	about	*
(output / input)		
2. Energy consumption rate for all Forging process:	about	Mcal/ton
3. Typical operation hours of Forging process		hours/day
	(hours/month)
4. Total products of casting per year		ton/year

3-3. Machining (1) Main specification and operating formation of major Equipments for energy consumption at Machining process

of EnergyNoName of equipmentSpecificationItemDesign $M_{\rm OG}$ Electricity1Name of equipmentMotor powerKwForm of operation $M_{\rm OG}$ <	Kind			Main specification			Form of	operation		
Electricity1Motor powerKatForm of operationMday(Except heatMotor powerMate of operation M/day bout(Except heatMotor powerMotor powerRate of operation M/day bout12Motor powerMotor power M/day bout M/day bout3Motor powerMotor power M/day M/day bout M/day bout4Motor power M/day M/day M/day M/day bout6Motor power M/day M/day M/day M/day M/day 6Motor power M/day M/day M/day M/day M/day 6Motor power M/day M/day M/day M/day M/day 7Motor power M/day M/day M/day M/day M/day 7Motor power M/day M/day M/day M/day M/day 8Motor power M/day M/day M/day M/day M/day 9Motor power M/day M/day M/day M/day M/day 9 <td>of Energy</td> <td>NO</td> <td></td> <td></td> <td>ication</td> <td>Item</td> <td>Desi</td> <td>gn</td> <td>~~~</td> <td>Actual</td>	of Energy	NO			ication	Item	Desi	gn	~~~	Actual
(Except heat(Except heat(Determined)<	Electricity			Motor power	К₩			h/day		h/day
treatment equipment)2Motor power motor powerKW motor portionForm of operation shouth/day shouth/day about3Motor powerKWPorm of operation poweraboutxaboutx4Motor powerKWPorm of operation Ret of operationaboutxabout5Motor powerKWPorm of operation Ret of operationaboutxabout6Motor powerKWPorm of operation Ret of operationaboutxabout7Rate of operation Ret of operationaboutxaboutx8Porm of operation Ret of operationaboutxaboutx6Motor powerKWPorm of operationaboutxabout7Rate of operationaboutxaboutxabout9Motor powerKWPorm of operationaboutxabout9Mashing machinePump motor powerKWPorm of operationaboutxabout9Mashing machinePump motor powerKWPorm of operationaboutxabout7Rate of operationaboutxRate of operationaboutxabout9Mashing machinePump motor powerKWPorm of operationaboutxabout9Mashing machinePump motor powerKWPorm of operationaboutxabout9Mashing mac	(Except heat					of	about	સ્ટ	about	26
equipment)aend of operationbout χ Bout χ Bout χ about3Motor powerMotor powerRate of operationh/dayabout χ about4Motor powerMotor powerRate of operationh/dayabout χ about5Motor powerMotor powerRate of operationabout χ about χ 6Motor powerMotor powerKWForm of operationabout χ about7Rate of operationabout χ χ about χ about7Mashing machinePump motor powerKWForm of operationabout χ about7Rashing machinePump motor powerKWForm of operationabout χ about7Rashing machinePump motor powerKWForm of operationabout χ about7Rashing machinePump motor powerKWForm of operationabout χ about8Rashing machinePump motor powerKWForm of operationabout χ about9Rashing machinePump moto	treatment		6.1	Motor power				h/day		h/day
3Molor power holor powerKwForm of operation Rate of operation h/day kout h/day kout4Molor powerMolor powerRate of operation h/day h/day 5Molor powerMolor powerKwForm of operation h/day h/day 6Molor powerKwForm of operation h/day h/day 6Molor powerKwForm of operation h/day h/day 6Molor powerKwForm of operation h/day h/day 7Mashing machinePump motor powerKwForm of operation h/day h/day 7Mashing machinePump motor powerKwForm of operation h/day h/day 8Mashing machinePump motor powerKwForm of operation h/day h/day 9Mashing machinePump motor powerKw </td <td>equipment)</td> <td></td> <td></td> <td></td> <td></td> <td>0 f</td> <td>about</td> <td>86</td> <td>about</td> <td>સ્ટ</td>	equipment)					0 f	about	86	about	સ્ટ
4 Motor power Kw Rate of operation motor motor 4 Motor power Kw Form of operation motor motor 5 Motor power Kw Form of operation motor motor 6 Motor power Kw Form of operation motor motor 7 Motor power Kw Form of operation motor motor 6 Motor power Kw Form of operation motor motor 7 Motor power Kw Form of operation motor motor 7 Motor power Kw Form of operation motor motor 7 Motor power Kw Form of operation motor motor 7 Mashing machine Pump motor power Kw Form of operation motor 7 Maste of operation about % about 8 Mashing machine Pump motor power Kw Form of operation m/day 8 Mashing machine Pump motor power Kw Form of operation m/day 9 Mashing machine Pump motor power Kw Form of operation m/day 9 Mashing machine <td>•</td> <td></td> <td>~</td> <td>Motor power</td> <td>КW</td> <td>0Î</td> <td></td> <td>h/day</td> <td></td> <td>h/day</td>	•		~	Motor power	КW	0Î		h/day		h/day
4 Molor power KW Form of operation h/day about 5 Molor power KW Form of operation about % about 6 Molor power KW Form of operation about % about 6 Molor power KW Form of operation about % about 7 Form of operation about % about % 7 Molor power KW Form of operation about % about 7 Form of operation about % about % about 7 Rashing machine Pump motor power KW Form of operation about % about 8 1 Rashing machine Pump motor power KW Form of operation about % about 3 Washing machine Pump motor power KW Form of operation about % about 3 Washing machine Pump motor power KW Form of operation about % about 4 Washing machine Pump motor power KW Form of operation bout % about 5 Washing machine <td></td> <td></td> <td></td> <td>-</td> <td></td> <td>of</td> <td>about</td> <td>કર</td> <td>about</td> <td>સ્</td>				-		of	about	કર	about	સ્
Form Action Rate of operation About % % About %<		4		Motor power	КЖ	of		h/day		h/day
5Motor powerKWForm of operationh/dayh/day 6 Motor powerKWRate of operationabout x about 6 Motor powerKWForm of operationabout x about 7 Rashing machinePump motor powerKWForm of operation h/day about 7 Rashing machinePump motor powerKWForm of operation h/day $about$ 7 Washing machinePump motor powerKWForm of operation h/day $about$ 8 Rate of operationabout x x x $about$ x 8 Rashing machinePump motor power KW Form of operation $about$ x $about$ 3 Washing machinePump motor power KW Form of operation $about$ x b $about$ 4 Washing machinePump motor power KW Form of operation $about$ x b $about$ 5 Washing machinePump motor power KW Form of operation $about$ x b $bout$ 5 Washing machinePump motor power KW Form of operation $about$ x b $bout$ 6 Washing machinePump motor power KW Form of operation $about$ x b $bout$ 6 Washing machinePump motor power KW Form of operation x b b b 6 Was	· · · · · · · · · · · · · · · · · · ·					of	about	8	about	96
Fuel and gas mont mont mont mont mont mont Fuel and gas 1 Washing machine Pump motor power KW Form of operation h/day mont Fuel and gas 1 Washing machine Pump motor power KW Form of operation h/day about Fuel and gas 1 Washing machine Pump motor power KW Form of operation about % % about % % about % % about % % % % about % % % about % % %				Motor power	КŊ	of		h/day		h/day
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Fuel and gas I Mashing machine Pump motor power Kw Form of operation h/day h/day Fuel and gas 1 Washing machine Pump motor power Kw Form of operation h/day about 2 Washing machine Pump motor power Kw Form of operation about h/day about 3 Washing machine Pump motor power Kw Form of operation about h/day about 3 Washing machine Pump motor power Kw Form of operation about k about 4 Washing machine Pump motor power Kw Form of operation about k about 5 Washing machine Pump motor power Kw Form of operation about k about 6 Washing machine Pump motor power Kw Form of operation about k about 5 Washing machine Pump motor power Kw Form of operation about k about 6 Mashing machine Pump motor power Kw Form o				Motor power	KW	of		h/day		h/day
and gasIWashing machinePump motor powerKWForm of operationh/dayh/day2Washing machinePump motor powerKWForm of operationaboutb/dayabout2Washing machinePump motor powerKWForm of operationaboutb/dayabout3Washing machinePump motor powerKWForm of operationaboutb/dayabout4Washing machinePump motor powerKWForm of operationaboutb/dayabout5Washing machinePump motor powerKWForm of operationaboutb/dayabout6Washing machinePump motor powerKWForm of operationaboutb/dayabout7Mashing machinePump motor powerKWForm of operationaboutb/dayabout7Pump motor powerKWForm of operationaboutb/dayabout <t< td=""><td></td><td>:</td><td></td><td></td><td></td><td>of</td><td>about</td><td>સ્લ</td><td>about</td><td>96</td></t<>		:				of	about	સ્લ	about	96
Temp. of liquid \mathbb{C} Rate of operationabout \mathbb{K} aboutPump motor power \mathbb{K} <	and		l Washing machine	Pump motor power	КЖ	of		h/day		h/day
Pump motor powerKWForm of operation h/day Temp. of liquid C Rate of operationabout h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day Pump motor power KW Form of operation $about$ h/day				Temp. of liquid	ပ	jo	about	અર	about	96
Temp. of liquid \mathbb{C} Rate of operationabout \mathbb{K} aboutPump motor power \mathbb{K} \mathbb{K} Form of operation h/day $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{K} $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{K} $about$				Pump motor power	K₩	oĺ		h/day		h/day
Pump motor powerKWForm of operation h/day h/day Temp. of liquid C Rate of operationabout x aboutPump motor power KW Form of operation $about$ x $about$ Temp. of liquid C Rate of operation $about$ x $about$ Pump motor power KW Form of operation $about$ x $about$ Pump motor power KW Form of operation $about$ x $buot$ Pump motor power KW Form of operation $about$ x $bout$ Pump motor power KW Form of operation $about$ x $bout$ Pump motor power KW Form of operation $about$ x $bout$ Pump motor power KW Form of operation $about$ x $bout$ Pump motor power KW Form of operation $about$ x $bout$				Temp. of liquid	ပ	of	about	26	about	96
Temp. of liquid \mathbb{C} Rate of operationabout \mathbb{X} aboutPump motor power \mathbb{K} \mathbb{K} Form of operation h/day $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{X} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{X} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{X} $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{X} $about$ Pump motor power \mathbb{K} Form of operation $about$ \mathbb{X} $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{X} $about$ Temp. of liquid \mathbb{C} Rate of operation $about$ \mathbb{X} $about$				Pump motor power	К₩	0 ť		h/day		h/day
Pump motor powerKWForm of operation h/day Temp. of liquid \mathbb{C} Rate of operationabout χ Pump motor power \mathbb{K} Rate of operationabout h/day Temp. of liquid \mathbb{C} Rate of operationabout χ Pump motor power \mathbb{K} Rate of operationabout χ Temp. of liquid \mathbb{C} Rate of operationabout h/day Temp. of liquid \mathbb{C} Rate of operationabout χ Temp. of liquid \mathbb{C} Rate of operationabout χ		_		Temp. of liquid	Ş	oſ	about	96	about	96
Temp. of liquidCRate of operationabout%aboutPump motor powerKWForm of operationh/dayaboutTemp. of liquidCRate of operationabouth/dayPump motor powerKWForm of operationabouth/dayTemp. of liquidCRate of operationabouth/dayTemp. of liquidCRate of operationabouth/day			Washing	Pump motor power	K₩			h/day		h/day
Pump motor powerKWForm of operationh/dayTemp. of liquidCRate of operationaboutPump motor powerKWForm of operationh/dayTemp. of liquidCRate of operationabout				Temp. of liquid	ç	0 Į	about	96	about	96
Temp. of liquidCRate of operationabout%Pump motor powerKWForm of operationh/dayTemp. of liquidCRate of operationabout			5 Washing machine	Pump motor power	КW	of		h/day		h/day
Pump motor powerKWForm of operationh/dayTemp. of liquidCRate of operationabout%				Temp. of liquid	ي د	of	about	96	about	96
of liquid C Rate of operation about %			6 Washing machine	Pump motor power	Κ₩	of		h/day		h/day
	·			Temp. of liquid	Ç	operation	about	96	about	96

Main specification and operating formation of major Equipments for energy consumption at Machining process

		Main	specification			Form of (operation		
of Energy 1	NO	Name of equipment	Specification	t i on	Item	Design	gu		Actual
Electricity		I Induction hardening	Ppower	КW	Form of operation		h/day		h/day
· · · · · ·		machine	Frequency	Hz	Rale of operation	about	કર	about	96
	2	Induc	Ppower	К₩	Form of operation		h/day		h/day
		machine	Frequency	Hz	Rate of operation	about	કર	about	96
•	3	Induction hardening	Ppower	Κ₩	Form of operation		h/day		h/day
		machine	Frequency	Hz	Rate of operation	about	કર	about	24
gas		Heating furnace	Kind of energy		Form of operation		h/day	,	h/day
			Temperature	С С	Rate of operation	about	96	about	96
	2	2 Heating furnace	Kind of energy		Form of operation		h/day		h/day
	:		Temperature	ي د د	Rate of operation	about	96	about	96
	3	3 Heating furnace	Kind of energy		Form of operation		h/day		h/day
	•		Temperature	С Г	Rate of operation	about	%	about	96
Compressed		lAir blow machine	Pressure		Form of operation		h/day		h/day
			Max. consumption	m3/min Rate	Rate of operation	about	8	about	96
	2		Pressure		Form of operation		h/day		h/day
:		after washing	Max. consumption	m4/min	Rate of operation	about	86	about	96
	3		Pressure		Form of operation		h/day		h/day
		after washing	Max. consumption	m5/min	Rate of operation	about	ж	about	96
	4	4 Air blow machine	Pressure		Form of operation		h/day		h/day
	-	after washing	Max. consumplion	m6/min	Rate of operation	about	8	about	96
	<u>ک</u>	5 Air blow machine	Pressure		Form of operation	-	h/day		h/day
		after washing	Max. consumption	m7/min	Rate of operation	about	%	about	96

V-9-3-52

3-3. Assembly

(1) Main specification and operating formation of major Equipments for energy consumption at assembly line

Ð		Actual	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	shout e
OR AL ASSEMUTY TIME	Form of operation	Design	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about %	h/day	about &
operating formation of major Equipments for energy consumption at		Item	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation a	Form of operation	Rate of operation	Form of operation	Rale of operation
agjor Equipments	U	fication	KW		КW		К¥		К¥		ЖX		KW		КЖ	ູ ເ	KW	Ç		m3/min		m4/min
ng lormation of H	Main specification	Specifi	Motor power		Motor power		Motor-power		Motor power		Motor power		Motor power		Pump motor power	Temp. of liquid	Pump motor power	Temp. of liquid	Pressure	Max. consumption	Pressure	May consumption
and) Name of equipment	l Assembly conveyor	for	2 Assembly conveyor	for	m		4	. *	5	-	. 9	· · · · · · · · · · · · · · · · · · ·	1 Washing machine		2 Washing machine		I Air blow machine	after washing	2 Air blow machine	oftor working
(1) Main specification	Kind	of Energy NO	Electricity		<u> </u>	· ·	· · ·				-3-5:			· ·	Fuel and gas		-		Compressed	Air	L	

assembly line	
perating formation of major Equipments for energy consumption at assembly li	
nts for energy c	
major Equipme	
formation of	
nd operating	
specification and oper-	

Main specification	cativ	on and operating formation of	ition of major	Equipments 101	HICLEY CONSUMPLIAN	ar abover of the	
Kind		Main	specification	-		Form of operation	
of Energy	NO	Name of equipment	Speci	ification	Item	Design	Actual
Electricity		l Electric nut runner	Motor power	KW	Form of operation	h/day	h/day
		(Electric driver)	Max. torque				
	2	2 Electric nut runner	1 1-4	Κ₩	Form of operation	h/day	h/day
		(Electric driver)	Max. torque				
		3 Electric nut runner	Motor power	ΚM	Form of operation	h/day	h/day
		(Electric driver)	Max. torque	-			
Compressed		Air nut runner	Pressure		Form of operation	h/day	h/day.
Air		(Air driver)	Max. torque				
		9 Air nut runner	Pressure		Form of operation	h/day	h/day
	• . 	(Air driver)	Max. torque			-	
		3 Air nut runner	1 0		Form of operation	h/day	h/day
		(Air driver)	Max. torque				
				· · ·	· · · · ·		
			· ·				
	• • •					· · · · · · · · · · · · · · · · · · ·	
- - - -							

3-4. Painting and Drying

(1) Main superification and onerating formation of major Equipments for energy consumption atPainting & Drying

Kind			Main specification			Form of operation	
of Energy	NO	Name of equipment	Specific	cation	Item	Design	Actual
		Paint booth			Typical product		
		(1)			Kind of paints		
_		. ·			Painting time	min/unit	min/unit
_					productivity	uni ts/day	units/day
					Form of operation	h/day	h/day
-							
		2 Paint booth			Typical products		
		(2)			Kind of paints		
					Painting time	min/unit	min/unit
: -					productivity	units/day	units/day
					Form of operation	h/day	h/day
·							
		l Drying furnace	Type		Typical products		
			Kind of energy		Drying time/unit	min/unit	min/unit
			power(lump)		productivity	units/day	units/day
-			Temp. of hot wind		Form of operation	h/day	h/day
		2 Drying furnace	Type		Typical products		
			Kind of energy		Drying time/unit	min/unit	min/unit
			power(lump)		productivity	units/day	uni i s/day
			Toma of hot wind		Form of operation	h / dog	webl d

(2)	How	do you	follow about it ?			
(3)	Ener		ervation promotion o			
(4)	Acti	ivity of	energy conservation	i committee		· · · · · · · · · · · · · · · · · · ·
						·····
(5)	The	group t	that execute mainly e	energy conservation	activity	•
(5)	The	group (lhat execute mainly e	energy conservation		
						· · · · · · · · · · · · · · · · · · ·
(6)	Sys	tem of c	collect the idea for	improvement and est		
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva	improvement and est tion in the past	imating system	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result
(6)	Sys Inv	tem of c	collect the idea for for energy conserva Contents of	improvement and est tion in the past Cost of	imating system Expectation	Result

(8) Energy conservation activity

Please mark applicable ones.

Example:	(A)	=Operating/Installed
	(B)	=Not perfect but operating as a role
		/Under construction
	(C)	=Not operating/Under planning

				†	
Process	NO.	Items	Appli	cation	Year of application
Management	· · ·	Awareness of energy conservation to employee)	
system		Education of correct operating method	·····)	
· ·		to employee			
	3	Collecting system of idea for improvement	()	
		and estimating system			
Operation	4	Operation in low electricity rate such as	()	· ·
		night and holiday			
system	5	Shift of operating time and working day	()	
		in order to use energy efectively	······	······	*****
	6	To turn off elctricity when no one is	()	•
		in the office	· · · · · · · · · · · · · · · · · · ·	······	
		To turn off the power of an equipment	().	
		that is not used for hours		······	
· ·		Control the temperature for a heater	()	
	9	Cleaning the electric appliances		:)	
	10	<u>(Cycle = years)</u> Light-on & light-off by actual bright			
. • •		(Outside lighting)		,	
• .		To use a efficiency light	(١	
n = 11=2	1			/	
ユーティリテイ		Reduction of compressed air pressure		· · · /	
· · · ·		Pressure control of compressed air	()	
	14	Pressure control of steam	()	
	15	Recovery steam drain	()	
	16	Control of power factor	. ()	
	17	To reduce a pressure loss of pipe	_ ()	
	18	Local supply of compreessed air by booster	. ()	
н — н	19	Suitable supply by number control of	()	
		small compreeser			
· · ·	20	To stop the compresser in plant holiday	()	
		To repair of broken windows and doors for	()	
		avoiding heat loss		<u>،</u>	
		To stop a few leak of compressed air even if it is no problem for production)	
an a	93	Enforce the insulation of steam pipe	() Ì	
· · · · · · · · · · · · · · · · · · ·		Jenteres ene inculation of Steam pipe	L		L

Process	NO.	Items	Applic	ation	Year of application
Casting	24	Improvement of energy consumption rate of	()	
		melting(ton)			
	******	To reduce the failure in casting	()	
	26	To reduce the idling time of machine	()	
		To avoid cold air invasion in treatment furnace	()	
		(Cupola)Pre-heating of blast by exhaust gas	()	
		(Cupola)Long and continuous operation	(······)	
		(Cupola)Oxygen enrichment in blast	. ()	
		To control the r.p.m of dust collector	(
		Stop of dust collector during stop of) ()	
		production line			
		Enforcement the insulation of furnace	ļ(···)	
	34	Concentrated control the accumulators of hydraulic system	(.)	
		(to combine several accumulator)			
	35	(Shot blast)Minimum time of shot blast	()	
	*****	(Shot blast)To control a suitable shot time	()	
		by work		·····	
	37	To reduce the idling time of sand treatment equipment at a lunch break)	:
	38	Recirculation of cooling water	()	
		To control a suitable blow time for molding	()	
	······	To reduce the idling time of grind motor	- ()	
	_	for casting			
Forging	41	To reduce the idling time of machine	()	
	42	To reduce the allowance by improvement of material	()	
	43	To avoid cold air invasion in heating	. ()	:
	44	furnace To avoid cold air invasion in heating	()	
		furnace			
	45	Simple arrangements toreduce preparation)	
	<u> </u>	time at line changing			
Machining	1	To reduce the idling time of machine)	
	4	To reduce the warm-up time	()	
	48	Use the function of one cycle stop")	1
		Operation Machinning Pause Machinning	٦	. [····
		Hydrauric Pump			e stop
		Drive Pause Drive	2		
		Drive		Non	stop

Process	NO.	Items	Appl	ication	Year of application
(machining)	49	Simplify the machining process	()	
		(no milling,drilling)			
	50	To reduce the amount of machining	()	
		(To reduce the machining time)		······	
	51	To reduce the failure of machining	()	
	59	(To reduce the energy of remake) To combine several machining process with	(}	
	54	multiple equipment to reduce		,	
		the number of equipment.			
	53	Control the temperature of washing liquid	()	
		Air blow after washing only during	()	
		the product is there.			
Assembly	55	To reduce the idling time of machine	()	
	56	To reduce the warm-up time	()	
	57	Use the function of"one cycle stop"	()	
		(refer NO.49)			
	58	To reduce the assembly process	()	
	59	To reduce the assembly time(speed up)	()	
· .	60	To reduce thefailure of machining	()	
Painting	61	To avoid cold air invasion in drving furnace	()	
and	1	To use quick dry type paint	()	
Drying		To reduce a thickness of coating	()	
Another		improvement the power factor of large sized	()	
Another		motor	Ì	,	
	65	Concentrated production	()	
		(close the factory during no product)	Ì		
	66	Improvement of quality(reduction of failure)	()	
	67	Replacement of old pump with high efficiency)	