8. Technical regulations

- (1) Order of installation

 This should be based on 12. accompaning documents (12), but changes are accepted according to the proceeding of construction work with agreement of supervisor or manager.
- (2) Outline of welding

A. Outline of welding

Kind of welding	Outline of welding
Fillet welding	Depth of weld should be over 70% & under 100% of thinner base metal's thickness.
Butt-welding	Beveling type should be 60°V type or 50°V type.

. B. Recommendation of welding rod

Welding materials		Welding	rod	in use
SS, SGP	Sumitomo	welding	rod	01A, 200, 300
STPG	11	15		03A
SUS304	11	Ħ		308

C. Note

- a. Temper color caused by welding of SUS304 should be removed by the sandpaper, etc.
- b. Outline of each welding should be followed by the drawings.

(3) Outline of painting

- A. Necessary place of painting
 - a. weld fitting parts of pipes & processing ones in site
 - b. connecting parts of structure
 - c. setting bolts, head of anchor bolts
 - d. weld fitting part
 - e. touch up painting parts
 - f. fluid name of pipes, flow sign
- B. Unnecessary place of painting
 - a. place painted in Japan

 - c. cast metals such as slag pot
 d. standard device 5 d. standard device of maker (valve, oil cylinder, etc.)
- C. Outline of painting and coloring

Outline of painting is refered to 12. accompanying document (13). Coloring should be matched surrounding.

(4) Inspection and passing standard

A. Assignment of work

Item	Contractor	Supervisor
Inspection enforcement	0	
Reports preparation	. 0	
Judgement of passing		0

B. Item of inspection

No	Item	contents	Passing standard	Note
1	Structure	each floor level	± 3mm	
2	Main & Sub- lance	hight of installation horizontal, vertical	± 2mm 0.1mm/m	
	elevator			
	Rotaring facilities		under 0.05mm	measured by
3	pump blower, etc.	centering of shaft	in face and circle	dial gauge, space gauge
4	Piping, sleeve flange weld	color check	normal	depth of weld, Out of bead
5	Weld except item 4.	outlook	normal	•
6	Painting	coloring and spots	judged by attendance	
7	Pipes airtight test	shown in following page		

Outline of pipes airtight test These should be done before the pipe painting work.

No.	Piping line	kg/cm ² G test pressure	contents of inspection	passing standard
1	02	(N ₂) 10	Soap test	No bubbling
2	Pulverized coal + N ₂	(N ₂) 10	II	II
3	N ₂	(N ₂) 10	egen eg it egen e	T H
4	LPG	(N ₂) 2	n (1)	i kan in
5	Air for combusion	(air) blower pressure	in.	
6	Make up water for air conditioner	(water) pump pressure	Check of leak by watching	No leak
7	Cooling water(go) (device is not included)	(water) pump pressure	n	gels dia gladin geografiche dia geografiche
8	Cooling water (return)	(water) '2	11	11 240
9	Compressed air	(air) 6	Soap test	No bubbling
10	Oil pressure each using pressure	(hydraulically- operated oil)	Check of leak by watching	No leak

9. Outline of test works

(1) Outline

Each item of this outline shall be used for estimation of man power for organization of accident prevention and checking points in test run period. Contents in detail and passing standard is checked by supervisor according to data prepared by each maker. And, for reference, independent equipments like motor, fan, pump, dryer, and so forth have been tested in Japan and their inspection sheets & reports of test run are packed with each equipment.

(2) Organization of test run

A. No-load test run

	Contractor (Mechanical, Electrical instrumentation)
Conductor	٥
Assistant of conductor	0
Operator	0
Check, record	0

B. Individual load test, Synthetic load test run

	Operation manager (IEE)	Operator (IEE)	Supervisor of installation work (IEE)
Conductor	0		
Assistant of conductor			0
Operator		0	
Check, record		0	

(Note) Contractor should attend this period.

(3) Preparation for test run (checking items in following table)

	Checking items
Electricity	(1) Measurement of earth resistance (circuit, equipment) (2) Sequence check (3) Idling test (conductor, solenoid volve, LS) (4) Direction of motor's revolution (5) Alarm, indication
Oil pressure	(1) Quantity of oil in the oil unit (MF, Hood)(2) Oil temp.(3) Pressure(4) Reduction of air
Utility	(1) Pressure(2) Flow rate(3) Operating of dryer for instrument
Instrumentation	 (1) Range adjustment of equipments (2) 0 point ajustment (3) Sequence check (4) Confirmation of indicator & controller by transmitter's signal
Others	(1) Flashing of pipes

(4) No-load test run

rotar Screw feeder Rotary feeder I.D.F. Dust collecting fan Burner fan Purner fan Incling machine of Gasifier Main lance elevator Sub-lance elevator Slag pot car Abnorm	g temp. equired & limit
I.D.F. Dust collecting fan Burner fan 2 Electrical Incling machine of Gasifier Switch Main lance elevator Sub-lance elevator Abnorm Slag pot car Abnorm	g temp. equired & limit adjustment
Dust collecting fan Burner fan Pust collecting fan Burner fan Incling machine of Gasifier Main lance elevator Sub-lance elevator Slag pot car Abnorm	equired & limit adjustment
reciprocator Gasifier Main lance elevator Sub-lance elevator Abnorm Slag pot car Abnorm	adjustment
reciprocator Gasifier Main lance elevator Sub-lance elevator Abnorm Slag pot car Abnorm	adjustment
Sub-lance elevator Abnorm	amp.
	al sound
Incline machine of M.F. Stroke	al vibration
reciprocator Hood for gasifier requir	, time ed pressure, al sound
Indica	tion of gauge
by air cylinder cylinder adjust L.S. a	djustment
valve Operat	tion of gauge ing confirma- rom controller
tion b	ment cy confirma- y weighing
test	
6 Overall M.F. Runner for pig iron	ve location
Gasifier Interv	ention rock test
1 2000 200 0000	ce idling test
Others	

(5) Individual load tests

No.	test item	Contents	Checking items
. 1	Utilities	 (1)Passing cooling water (2)Ajustment of O₂,N₂,LPG Reducing valves, etc. (3)Meter constant adjustment of controller 	°Flow rate °Pressure
2	Emergency test	(1)Power failure (2)Suspension of water supply (3)Compressed air failure (4)Engine pump operation	"open"&"close" of valves (cylinder valve, solenoid valve) Counter weight of lance&sub-lance Automatic operating of engine generator
3	Burner, Combustion test	(1)Burner's ignition for furnace (2)Burner's ignition for runner	°Rising temp. of furnace
4	Flare stack, Ignition test	Flare stack's ignition & accidental fire test	Inspection of accidental fire (thermo-couple)
5	Melting test	Feed the pig iron in gasifier after scrap melting	°Rising temp. of cooling water °Melting time °Temp. of pig iron °Locus of discharging pig iron °Electricity, Voltage, Amp.
6	Gasifier keeping test	Discharge the pig iron from gasifier after keeping in it for certain time	"Rising temp. of cooling water "Measurement by sub-lance "Locus of discharging pig iron "Amp., Electricity

No.	Item	Contents	Checking items
7	Coal drying test	Banko coal (120kg) drying in coal dryer	°Moisture measurement of coal before and after drying °Check of Amp.& smoke °Required time
8	Coal pulverizing	Pulverizing the dried coal & storing into blow tank	°Required time for pulvering °Grain size of pulverized coal °Amp. of motor
9	P.C.injection test	Giving pressure to blow tank and inject the P.C. and gather it by dummy bug filter	"Pressure of blow tank "Flow rate of N, "RPM of rotary feeder "Volume of P.C. recovered "Amp. of rotary feeder "Comparison of caluculated volume of PC with recoved volume of it

(6) Synthetic load test run

Items of (5) Individual load tests are done in accordance with actual operation system.

Operation plans are prepared by the operation manager of IEE.

10. General matters

- (1) When extension of construction work out of contractor's scope occurs, another agreement should be done.
- (2) The period of guarantee is one year from the day of completion of construction (after load tests of each facility).
- (3) Overhead crane lended free from Indonesia and fork lift transportated may be possible to use. But their operation should be done by contractor.
- (4) Necessary drawings for installation in site should be supplied afterwards. But adjustment in site should be treated in site condition, if necessary.
- (5) Fitting and installation should be done by drawings and each specification. Order of construction and construction schedule should be determined with supervisor.
- (6) Assembling of disintegrated facilities for the purpose of convenience in transportating should be done according to the marking which had been assembled in Japan or assembly drawings. And at this time, accracy of assembling should be keeped. (Fragile facilities are not apt to assemble.) This item should be in the scope of contractor.
- (7) Plant enforcement should be done by the lisenced welder.
- (8) Plant installation site should be cleaned and put in order every day.
- (9) Additional materials & man-hour by the modification for constructive convenience should not be regarded as the additional construction work. Also, necessary incidental works judged by common sence which are not listed on specification and drawings should not be regarded as the additional ones.

11. Construction acceptance

Construction acceptance is done by inspection of supervisor or operation manager after the completion of the construction and synthetic load test run. This should be regarded as JICA's passing and construction acceptance.

12. Accompaning documents

- (1) Location of construction site, PUSPIPTEK The second secon
- (2) Whole plan
- (3) Front view, side view
- (4) Grand floor layout, First floor layout 2nd, 3rd floor layout
- (5) Piping diagram (1/2)
 " (2/2)
- (6) Electrical drawings
 - A. External shape of control panel, operating panel, etc.
 - B. Developing connection diagram
 - C. Wiring work drawings (distribution diagram, mutual connection diagram, etc.)

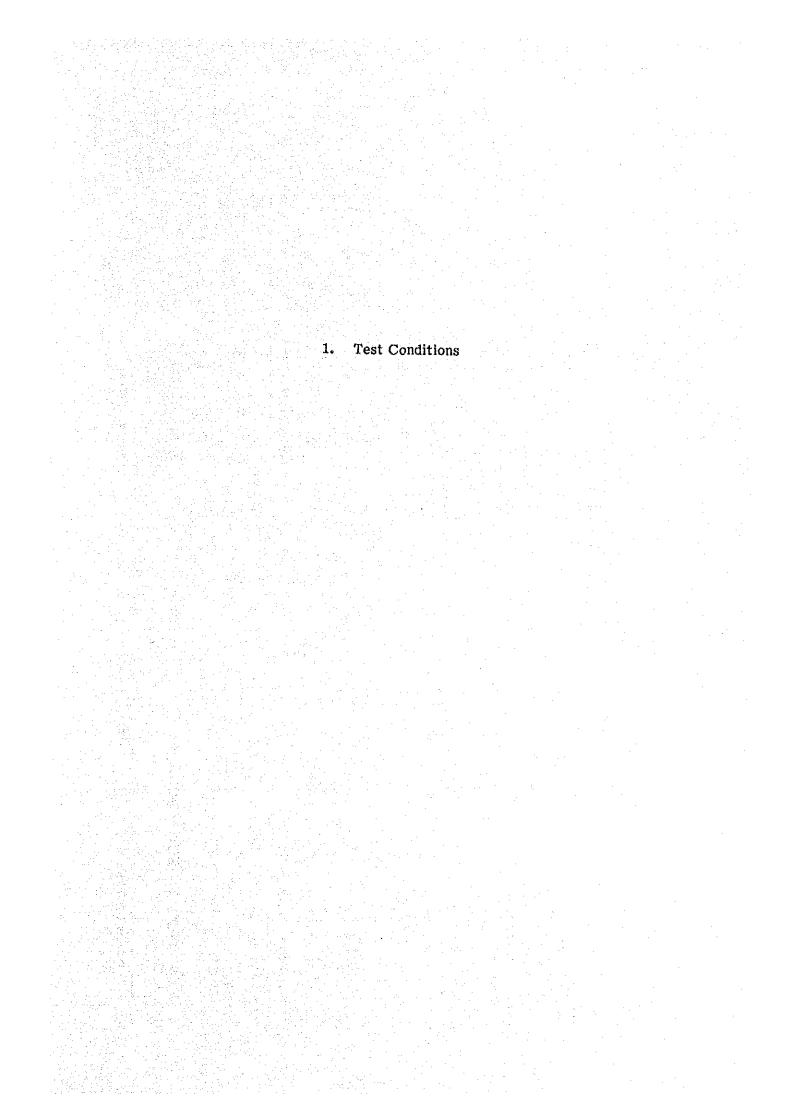
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- (7) Instrument drawings
 - A. External shape of indication panel, gascro anlyzer
 - B. Hook up chart
 - C. Wiring work drawings
 D. Pipe work drawings
- (8) Cable tray arrangement drawing
- (9) Lighting, Receptables, welder for repair
- (10) Anchor plan
- (11) Utilities match point
- (12) Procedure of installation
- (13) Specification of painting
- (14) Work schedule (for reference)

ATTACHMENT 8-3

		Page
1.	Test Conditions	105
2.	Test Results	161



TEST000-1

1987.08.19. (Wed.)

DATE

RUN NO. CG001

Coal gasification - 1

1. PURPOSE of RUN
1) Coal gasification for BUIA1 & BUIIA1 coal
2)

2.COAL SANPLY and OPERATION CONDITION COAL SANPLE - A.

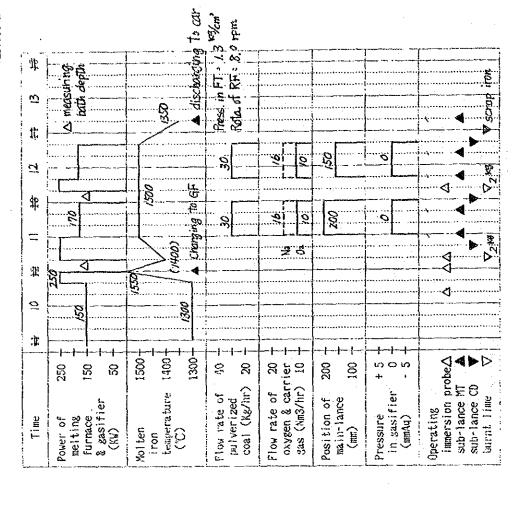
Sample number	ກວດ	BUIA1,	BUIA1, BUIA1		
Proximate analysis Ultimate analysis	analysis	Ultimate	analysis	Ash components	nents
Moisture Ash V.M. F.C. T.S.	22.21 5.21 35.03 36.17	OEZO	75.77	S102 A1203 Ca0 K20 Na20	ह र हर हर हर हर

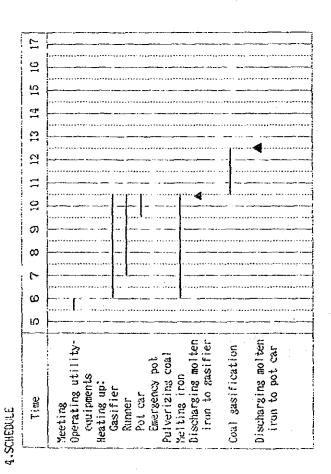
OPERATION CONDITION - A

vet Kg Kg KS Nm3/hr Nm3/hr Kg/hr mm ပူပူပု 16.0 10.0 30.0 200, 150 \550 \500 \500 \2350 \250 \235 \235 \235 Molten from temperature on discharge to gasifier on coal gasification on dischare to not car Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance over bath surface Basicity of slag Weight of coal Weight of burnt lime

Ash components 7.20 Na.20 Na.20 Proximate analysis Ultimate analysis OHRO CUAL SAMPLE - B Sample number Moisture Ash 7.5.7.

Kg Na3/hr Na3/hr	75/0r E	ပူပွဲပု	Wet Kg
300			in and a second
Weight of molten fron Flow rate of Oxygen Flow rate of currier gas	Figw rate of pulverized coal Position of main-lance over bath surface Moiten inon temperature	on discharge to gasifier on coal gasification on dischare to pot car	Basicity of slas Weight of coal Weight of burnt lime





TEST000-1

CG 002 RUN No. 2nd Coal Gasification Test Run 8 S S 1987.08.#0.27. (Thu.) DATA

1. PURPOSE of RUN

1) Coal Gasification Test for BSIA2 & BSIA2 Coal. 2)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE - A

Ash components A1203 2018 Na 20 Cao **K20** 75.13 % 5.87 % 1.16 % Ultimate analysis BSIA2 & BSIIA2 0,21 OEZO Proximate analysis dry base \$ 00 to 43.32 43.88 se 47.88 se Sample number Moisture V.M. <u>ن</u> Ash -107

OPERATION CONDITION-A

vet Kg Kg Nm3/hr Nm3/hr Kg/hr ಭ ಭ ಭ 12, 15 10 20, 25 200, 170 300 5. 1550 1500 ₹/350 on discharge to gasifier Flow rate of pulverized coal on dischare to pot car on coal gasification Flow rate of carrier gas Moiten iron temperature Position of main-lance over bath surface Weight of molten iron Weight of burnt lime Flow rate of Oxygen Basicity of slag Weight of coal

33

COAL SAMPLE - B

Sample number	mber					
Proximate	analysis	Ultimate	analysis	Proximate analysis Ultimate analysis Ash components	nents	
Moisture	O	O	Sic	Si02		9-6
Ash	ે	==	3 •₹	A1203		ે લ
×.	≽e	Z	> e	Ca0		9-6
J.	≽ -€	0	≽ -₹	K20		ક્ર
7.5.	> €			Na 20		36

300 Kg	Nm3/hr	Nm3/hr	Kg/hr			-	ņ	Ş	ಭ	1.5	wet Kg	8%
Weight of motten iron	Flow rate of Oxygen	Flow rate of carrier gas	Flow rate of pulverized coal	Position of main-lance.	over bath surface	Notten from temperature	on discharge to gasifier	on coal gasification	on dischare to pot car	Basicity of stag	Weight of coal	Weight of burnt lime

47

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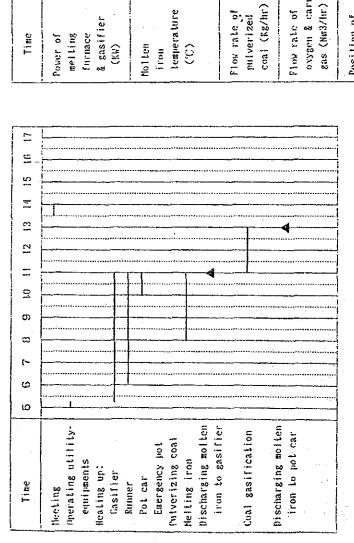
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Time

4.SUNEBULE



Discharging 10 pol car

Charging To GF

1300

40

20

coal (Kg/hr)

20

flow rate of

oxygen & carrier gas (N#3/hr) 10 200

Position of main-lance <u>00</u>

(HE)

in gasifier

(may 1)

Pressure

temperature 1400-

II o

1500-

150

Гигнасе

250

Power of meiling 20

(KH)

& gasifier

Recs in Fit Rat. of RT

After measuring bath depth

- 1) Raising bath temperature
- 4) Injecting PC

immersion prohe A

Operating

sub-lance MT sub-lance CD

burnt line

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201	
O	
0	
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31-	
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	RUN NO. CG003	
	RUN Coal Gasification Test	The state of the s
ſ		

1. PURPOSE of RUN
1) Coal Gasification Test for BUIIB2
2)

1987. 68-10.

DATA

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE - A

Bum 62	Proximate analysis Ultimate analysis Ash components (dry bose)	73.10% \$ 5:02 %	5.80 % A1203 %	1.25 % Ca0	18.51 % K20 %	Na20
	mate analysis Ul	φ¢ Ο	2.29 % H	N % 85 Lh	48.02 % 0	₩
Sample number	Proxima (dr	Moisture	Ash	. W. W	ن -10	# 19-

OPERATION CONDITION-A

Weight of molten iron	300	80 X
Flow rate of Oxygen	13.7	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/br
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance	200	
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	ပူ
on coal gasification	005'	ပ္
on dischare to pot car	= 1350	ပ္
Basicity of slag	 .v	
Weight of coal	30.	wet Kg
Weight of burnt lime	(E)	*

Sample number	S			
Proximate and	alysis	Ultimate	analysis	Proximate analysis Ultimate analysis Ash components
Moisture	>6	O	১২	Si 02
Ash	84	m	>€	A1203
E	38	z	3-8	Ca0
 	3 -8	0	3-6	K20
		•		•

COAL SAMPLE - B

ଳ କ

Weight of molten iron	300	× 80
Flow rate of Oxygen		NE3/hr
Flow rate of carrier gas		N#3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance		###
over bath surface		
Molten iron temperature		
on discharge to gasifier		Ų
on coal gasification		ပူ
on dischare to pot car		ပ္
Basicity of slag	1.3	
Weight of coal		vet x8
Weight of burnt lime		×0 ×
_		

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\$17

#=

7 : ne

4. SCHEBULE

4₽

150

furnace

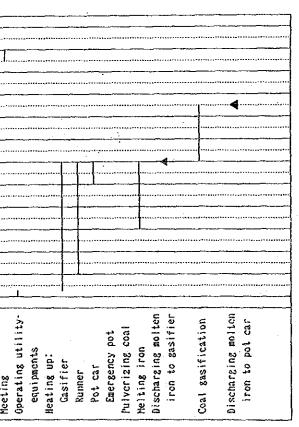
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Power of melting 8

(KE)

& gasifier

7 5 14 3 ~ = 2 Ş α ဖ D) Operating utility-Discharging molten iron to gasifier Discharging molton Coal gasification iron to pol car Pulverizing coal Emergency pot Melting iron equipments Heating up: Gasifier Pot car Runner Meeting



1300+

coal (K&/hr) 20

Flow rate of

pulver i zed

Flow rate of 20 oxygen & carrier gas (Nm3/hr) 10

temperature 1400-

1500-

Molten ron , 6, 77.

2

200

main-lance Position of

100

(##)

3 ° 7

1) Raising bath temperature After measuring bath depth zo Injecting Oxygen 4) Checking burnin 3> Tilling gasifier

+ non

in gasifier

Pressure

(mm4c)

immersion probe∆

Operating

sub-tance MT sub-lance CD

burnt lime

TEST000-1

4th Coal Gasification Test Run - Rus

KUN NO. CG DOL

1.PURPOSE of RUN
1) Coal gasification test run for BSIVB coal.
2)

2. COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A.

Sample number	. :	BSIVB			
Proximate analysis	× .	Ultimate	analysi	Ash components	nents
Moisture Ash V.M. F.C.	\$ 9 \$\$ 5 \$ \$ 2 \$\$	omzo <u>ភ</u>	73.69 7.09 7.07 7.03 8.88 8.88 8.88 8.88 8.88 8.88 8.88 8	S102 A1203 Ca0 K20 Na20	કર કર કર કર ક ર

OPERATION CONDITION - A

Weight of molten iron	300	χ 8
Flow rate of Oxygen	28	Nm3/hr
Flow rate of carrier gas	001	Nm3/hr
Flow rate of pulverized coal	0.51	K&/hr
Position of main-lance	200	
over bath surface	· • •	
Molten iron temperature	, i	
on discharge to gasifier	0551	ပု
on coal gasification	1500	ပ္
on dischare to not car	1350	ပူ
Sasicity of slag	1.5	
Weight of coal	70	wet K8
Weight of burnt lime	0	×,

1087.09 08 · (Tu) DATE

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COAL SAMPLE - B

		२६२६ ६६४६
	Ash components	S 102 A 1203 Ca 0 K20 Na20
	Proximate analysis Ultimate analysis	≽द ठ द ३ ६
	Ultimate	ONHO
umber	analysis	ठेल ठे र २२ ठे र
	Proximate and	Moisture Ash V.M. F.C. T.S.

Weight of moiten iron	300	χ
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		N#3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance		TIME
over bath surface		
Molten iron temperature		
on discharge to gasifier		ູນ
on coal gasification		Ų
on dischare to pot car		ပု
Basicity of slag	1.51	
Weight of coal		ret X8
Weight of burnt lime		×

- 10051 +00%1 Uperating innersion probe Sub-lance M & Sub-lance CD V tescenture 1909-Flow rate of 20 -oxygen & carrier -gas (Mm3/hr) 10 -Position of 200 - main-lance (am) 100 င္ ratvertized cost (Kg/hr) 26 in gasifier (mmAq) flow rate of ressure forer of metiting furnace 10 test

1) Measuring bath depth.

- 2) Heating up-bath temperature.
- 3) Confirming bath temperature about 1500'C 4) Setting new probe for produced gas
 - 5) Purging Na in new probe
 - 6) Injecting Oz
- 7) Confirming burning 8) Injecting PC.

after 10 min.

Starting to induce produced gas into new probe

9) Inducing produced gas into new probe.

Discharging molten iron to put car

Bischarging molten iron to sasifier

Cacraency pot Putverizing coal kelting iron

Matthe up: Casifier Sumer Pot car

Coat gadification

éperading adilily-equitogeds

4.SCHORCE

TEST000-1

CG 005 RUN No. 5th Coal Gasification Test Run 2

1. PURPOSE of RUN

1) Coal gasification test run for BSICI coal

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE -A

Ash components 76.44% 5.833% 1.40% 15.76% Proximate analysis | Ultimate analysis **BSIC** 2.65 46.45 50.46 6.58 8.58 8.58 8.58 Sample number Moisture 7.C 4:37

OPERATION CONDITION - A

Fet K3 Ng3/hr Kg/hr 300 76.00 25.00 200 200 1550 1590 1350 1.5 20 Motten from temperature on discharge to gasifier on coal galification on dischare to pot car Flow rate of Oxygen
Flow rate of carrier gas
Flow rate of pulverized coal
Postition of main-large
over bath surface Weight of moiten iron Weight of coal Weight of Burnt line Sasicity of stag

(元) // (元) DATE

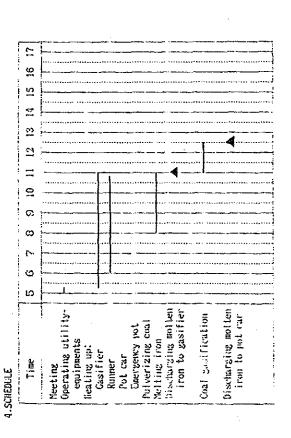
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COAL SAMPLE - B

Ash components 988 Proximate analysis Ultimate analysis OMMO Sample number Noisture ن سا Ash

Weight of molten iron	300	×
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas	-	Mas/hr
Flow rate of pulverized coal		Ke/hr
Position of main-lance		uu.
over bath surface		
Molten from temperature		
on discharge to gasifier		ņ
or coal gasification		స
on discharg to pot car		ပ္
Busicity of slag	1.5	
Weight of coal		Vot XX
Weight of burnt lime		۵ <u>۵</u> کاد

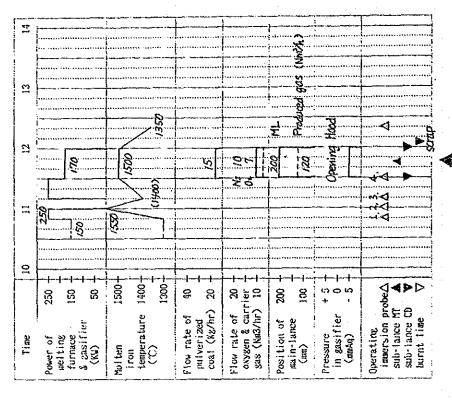




- 1) Messuring bath depth.
- 2) Heating up bath temperature.
- 3) Confirming bath temperature about 1500°C
 - 4) Setting new probe for produced gas 5) Purging No in new probe

 - 6) Injecting Oz
- 7) Constirming burning 8) Injecting PC. ofter 15 min.

9) Inducing produced gas into new probe.



Starting to induce produced gas into new probe

1-860331

6th Coal Gasification Test Run RUN NO. CG006

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(RAM) · 9/ · 60 · 1861

DATE

89

BUIA2 & BUIIA2 cool BUIICI 1. PURPOSE of RUN 1) Coal gasification test run for 2) Coal gasification test run for

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

26 26 24 26 Ash components Si 02 A 1203 K20 K20 K20 K20 A BUILAZ Proximate analysis | Ultimate analysis Bul A2 OEROV 3.29 46.08 50.63 0.24 Sample number Moisture

OPERATION CONDITION-A

wet Kg Kg Ks Nm3/hr Nm3/hr Kg/hr ಗೆಗೆಗೆ 300 74.4 10.0 25.0 1550 1500 1.5 75 0 Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal on coal sasification on coal sasification on dischare to pot car Molten iron temperature Position of main-lance over bath surface Basicity of stag Weight of coal Weight of burnt lime

Ash components S102 A1203 K20 Na20 Proximate analysis | Ultimate analysis BUICI CHZON 1.40 4.6.04 52.06 0.44 COAL SAMPLE - B Sample number Moisture Ash V.M. F.C.

Weight of molten iron	300	86
Flow rate of Oxygen	13.9	Nm3/hr
Flow rate of carrier gas	001	NE3/hr
Flow rate of pulverized coal	25.0	Ks/hr
Position of main-lance	200	an an
over bath surface		
Molten iron temperature		
on discharge to gasifier	1	Ų
on coal gasification	1500	ပ္
on dischare to pot car	032/	ņ
Basicity of slag	 	
Weight of coal	15	wet Kg
Weight of burnt lime	0	32

▶ motten ron. ▽ slag

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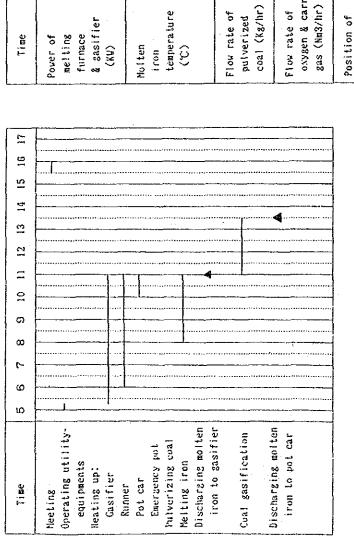
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\$º7

#2

Time

4. SCHEDULE



Ret. of RF

1300+

20

coal (Kg/hr)

pulverized

40

20

1500+

20

(KU)

150

& sasifier

250

temperature 1400-

3

iron

8 Z

gas (Nm3/hr) 10

oxygen & carrier

200

main-fance

300

(E)

1) Raising bath temperature After measuring both depth

3> Tilling gasifier 4) Checking bunnin

5) Injecting PC

2) Injecting Oxygen

immersion probe∆

Operating

sub-tance MT sub-lance CD

burnt lime

, JU

(pund)

in gasifier

Pressure

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in

RUN No. CG007 REN 7th Coal Gasification Test Run

1. Purrost of Rin 1) Coal gasification lest run for CBB1 2) Coal gasification lest run for CBB2

2. COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A

Ash components Proximate analysis Ultimate analysis 71.83 ... 20.73 ... 0.33 Sample number CBB1 omzo h 5,79 % 47.09 % 0.33 % Boistme ¥.5.5 ∴.S.5. ASH

OPERATION CONDITION-A

wet Kg Kg K& N#3/hr N#3/hr Kg/lur 72.6 25.9 200 200 1550 1500 1.5 1.3 Motten from temperature on discharge to casifier Flow rate of pulverized coal on coal gasification on dischargeto pot car Rasicity of stas Weight of coal Flow take of exygen this take of carrier gas Position of main-lance Weight of motten iron or bath surface

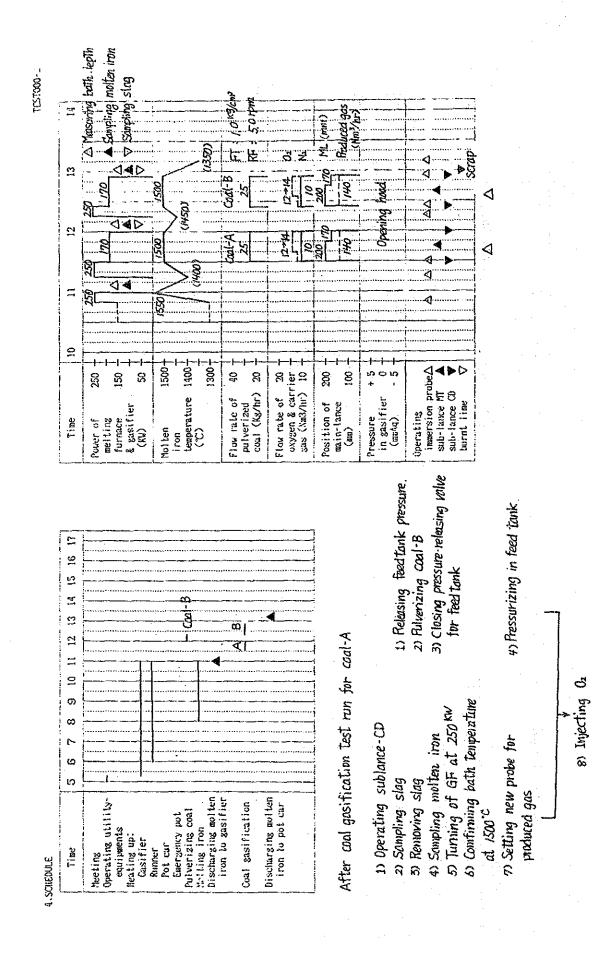
(Ju)	•
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3) Goal gasification test run for AR.

COAL SAMPLE - B

Sample number	lber	CBB2		
Proximate	roximate analysis	Ultimate	analysis	Ash components
Noisture Ash V.M. F.C. T.S.	5.96 % 46.15 % 47.89 %, 0.34 %,	೧ ಪ ವ ೦ ನ	13.73 1.73.78 1.73.79 1.73.78 1.53.78	Si02 A1203 Ca0 K20 Na20

Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal	300 12.8 10.0	K8 Nm3/hr Nm3/hr Kg/hr
Position of main-lance over bath surface Noiten iron temperature	200	
on discharge to gasifier on coal gasification	0051	ಭಭ
on discharge to pot car Basicity of stag	/350 1.5	ပူ
Weight of coal	<u>ئ</u> ا	vet Kg Kg



TEST000-1

NUN No. CG 008 8th coal gasification test run

2. X

1. PURPUSE of RUN

BUIEL, BUITEL & BUTEL COAL BSIA2 & BSIA2 COAL 2) Cool gosification test nun for 2) Cool gosification test nun for

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A

Ash components BUILB1, BUITB1, BUTB1 Proximate analysis | Ultimate analysis 45.92 50.00 50.00 50.00 Sample number Moisture Ash

OPERATION CONDITION-A

Ks Nm3/hr Nm3/hr wet Kg Kg Kg/hr 300 13.2 25.0 25.0 1550 55.50 Flow rate of fixygen Flow rate of carrier gas Flow rate of pulverized coal on discharge to sasifier on coal sasification on dischare to put car Molten iron temperature Position of main-lance over bath surface Weight of molten iron Basicity of slag Weight of coal Weight of burnt lime

£ 1987.09.25 DATE 3) Goal gasification test run for AL coal 4)

COAL SAMPLE - B

Sample number	ะ	BSIAZ,	BSIIA2		
roximate analysis	ralysis	Ultimate analysis	analysis	Ash components	ents
			75.13%	Si02	. } =
Ash		tt	5.87 %	A1203	7.4
	562 %		1.16 %	0g0	₹-₹
F.C	% 88 57		17 63 %	K20	8-8
Š.	0.20 %	γý	0.27	Na20	১ ୧

Weight of molten iron	-	SUL,	K
	•	2	ŝ
Flow rate of Oxygen		/#/	NH3/hr
Flow rate of carrier gas		10.0	Nm3/hr
Flow rate of pulverized c	• •	25.0	K ₂ /hr
Position of main-lance	•	82	
over bath surface			
Notten iron temperature			
on discharge to gasif	Fier		့
on coal gasification		1500	ပ္
on dischare to pot ca	•	;	ڼ
Basicity of slag		ιż	ı
Weight of coal		15	wet Kg
Weight of burnt lime		_	30

RUN No. CG008 2

1. PURPOSE of RUN

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - C

	omentis	२ २ २ २ ३१ ३९ ३१
	Ash components	S102 A1203 C20 K20 Na20
Sample number AL	una lysts	6. 2. 2. 7. 7. 25. 25. 25. 25. 25. 25. 25. 25. 25. 25
	ysis	: О жио ::
		15.12 41.91 42.97 1.93
	Provinate	Noisture Ash V.S. F.C.

OPERATION CONDITION - C

wet Kg Kg Ks Nm3/hr Nm3/hr 1500 1350 11.5 7.5 300 25.0.0 200 200 Molten from temperature on discharge to saxifier on coal gasification on dischare to pot car Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance over bath surface Basicity of stag Weight of coal Weight of burnt lime

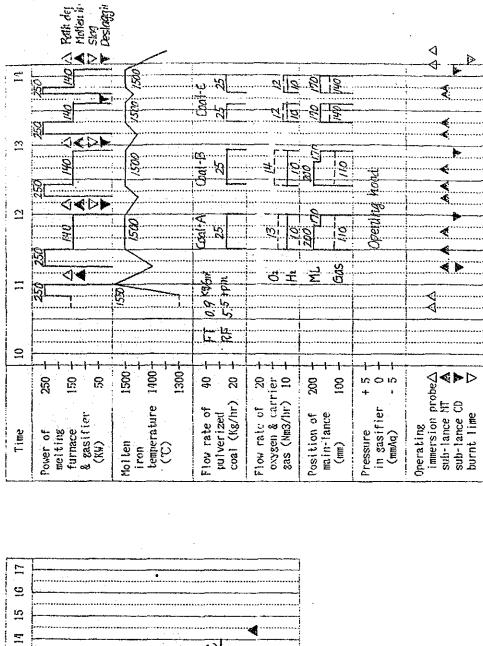
1987.09. 25 . (Fr.) DATE

COME SAMPLE - D

Sumple number				-
਼ਰੋ	Ultimate	analysis	Ash components	
Noisture Ash T.C.	UH20	≯€ ⋩⋞ ≥% ⋩€		\$2 \$2 \$4 \$4 \$4

Kg Nm3/hr	Na3/hr	Kg/hr		-		ပ	ပ္	ပုံ		wet Kg	% %
Weight of molten iron Flow rate of Oxygen	Flow rate of carrier gas	Fiow rate of pulverized coal	Position of main-lance	over bath surface	Molten iron temperature	on discharge to gasifier	on coal gasification	on dischare to pot car	Basicity of slag	Weight of coal	Weight of burnt lime

1.STIENTE



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	CG009	
	RUN No.	
Commence of the commence of th	RUN 9th coal gasification test run RUN No. CG009	
	cool gasi fication	
************	th cool	
	6	
	S.	

1.PURPOSE of RUN
1) Investigation of gasification-characteristic
22 for SJE1, SJE2 and BJS coal,

2.COM, SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Ash components Proximate analysis Ultimate analysis 70.4 57.48 22.84 0.13 0.17 SJEZ 50.15 47.77 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 53.55 54.55 Sample manher Noisture Ash V.M. F.C.

OPERATION CONDITION - A

Weight of molten iron	300	ж 8
Flow rate of Caysen	/2./	NEGATIVE
Flow rate of carrier sas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	.]]
Position of main-lance	200	H
over bath surface		
W i from temperature		
on discharge to gasifier	1550	ပ
on coal gasification	1500	ပူ
on dischare to pot car	1	ပု
Basicity of slag	100	
Weight of coal	9/	set. K
Telsht of burnt line	0	Š

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1987.09.30 · (NAZ)

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COAL SAMPLE - B

		34 54 34 54 54
ļ	s;ueuc	·
	Ash components	Si 02 AI 203 Ca0 K20 Na 20
	analysis	8.7.7.4.0 6.88.70.00 8.85.85.86
BJS	Proximate analysis Ultimate	OHZON
liper.	analysis	47.74 47.04 47.74 47.74
Sample number	Proximate	Moisture Ash V.M. F.C.

300 Kg 11,3 Na3/hr	10.0 NB3/hr 25.3 E-/27		ţ	1500 1500	1.5 77 web Ke 0 Kg
Weight of molten iron Flow rate of Oxygen	Flow rate of carrier gas	Position of main-lance over muth surface	Molten iron temperature on discharge to gasifier	on coal gasification on dischare to pot car	Basicity of slag Weight of coal- Weight of burnt lime

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RUN NO. CG009 RGN SCN

1.PURPOSE of RUN 1) 2)

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - C

	Ash components	Si02 A1263 Ca0 K26 Na20
		70.22 5.92 % % % % % % % % % % % % % % % % % % %
SJE 1	Proximate analysis Ultimate analysis	OEZO
Inber	analysis	7.14 51.08 41.51 1 21.08 32 32 32 32 32 32 32 32 32 32 32 32 32
Sample number	Proximate	Noisture Ash V.M. F.C.

OPERATION CONDITION-A

Weight of motten iron	300	33,
Flow rate of Oxygen	11.6	Nm3/hr
Flow rate of carrier gas	10.0	Nn3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance	200	tititit.
over bath surface		
Nolten iron temperature	•	
on discharge to gasifier	1	ပ္
on coal gasification	1500	ပ္
on dischare to pot car	1350	ņ
Basicity of slag	1.5	
Weight of coal	ŕί	50 to 18
Weight of burnt lime	0	% X

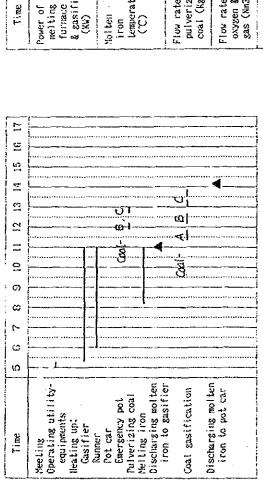
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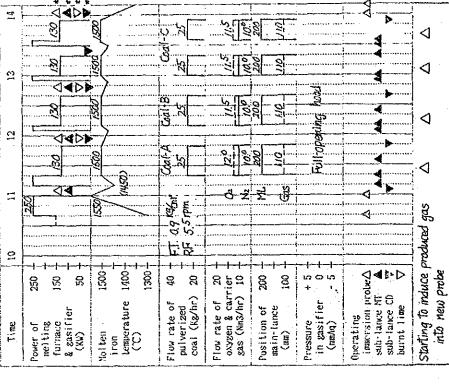
COAL SAMPLE - D

Sample number	nber			·	
Proximate	S	Ultimate	analysis	Ash components	nents
Maisture Ash V.M. F.C.	\$6 \$6 \$6 \$6 \$6	OHZO	38 38 38	Si02 A1203 Ca0 K20 N#20	\$2 \$4 \$-5 & 2 2 4

Weight of molten iron	uo		∞ 00
Flow rate of Oxygen			N#3/hr
Flow rate of carrier gas	r gas		NEG/Pr
Flow rate of pulverized coal	ized coa!		Kg/hr
Position of main-Jance	rce rce		11/18
over hath surface	ə		-
Molten iron temperature	ture		
on discharge to gasifier	Sasifier		ږ
on coal gasification	ation		ပ
on dischare to pot car	pot car		زز
Basicity of slag			
Weight of coal	,		wet Kg
Weight of burnt lime	a	0	20 24
_	•		

4.SCHEDULE





*1 \(\trianglerightarrow\) Measuring balk depth *2 \(\mathbf{L}\) Sampling molten iron

Sampling slag

×3 ▼

RUN NO. CG010 10th coal gasification test run 37

1. PURPOSE of RUN of gasification-characteristic tor CBC, EBA1 and CBA2 coal

2. COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A

Teh components Si 02 A1 203 Ca0 K20 Na 20 72.72 5.88 7.48 7.48 0.37 Proximate analysis | Ultimate analysis CBC OEZO W 6.15 % 47.08 % 46.77 % Sample number Moisture Ash V.M. F.C.

OPERATION CONDITION-A

vet Kg Kg Nm3/hr K.(./hr E ಗಗಗ 500 1 2 4 1 388 72.6 25.0 200 200 200 200 Position of main-lance
over bath surface
Molten iron temperature
on discharge to gasifier
on coal gasification
on dischare to pot car Weight of molten from Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Basicity of slag Weight of coal Weight of burnt lime

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COAL SAMPLE - B

Sample number	nber	CBA2		
Proximate	roximate analysis Untimate	Ultimate	analysis	Ash components
Moisture Ash V.M. F.C.	10.94 10.94 14.05 144.05	υπ≍ογ	7, 56 5,73 1, 16 21, 25 21, 25 35 35 35 35 35 35	Si02 41203 Ca0 K20 Na20

Weight of autien from	300	50 34
Flow rate of Oxygen	13	NE3/11
Flow rate of carrier gas	00	Nm3/hr
Flow rate of pulverized coal	250	Ka/hr
Position of main-lance	. 6	mm
over bath surface	2/17	
Molten iron temperature		
on discharge to gasifier	1	ţ
on coal gasification	0051	ပူ
on dischare to pot car	•	ပ္
Basicity of slag	1.5	
Weight of coal.	70	wet Ka
Weight of burnt lime	1	82

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RUN NO. CG010

1987.09.

DATE

1.PURPOSE of RUN 1)

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - C

Sample number *CBA*1

Provimate analysis Ultimate analysis Ash components

Noisture — " C 69.60" S102

Ash 17.03 % H 5.76% A1203

V.M. 42.73 % N 1.12 % Ca0

F.C. 40.24 % O 21.81 % K20

T.S. — % S 1.71 Na20

T.S. - % S 1.71 Na20

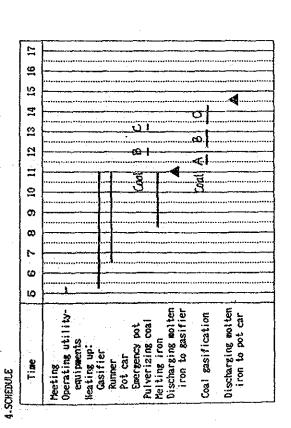
CPERATION CINDITION - C

Weight of molion from 200 Kg
Flow rate of Oxygen
Flow rate of currier gas
Flow rate of pulverized coal 25.0 Kg/nr
Flow rate of pulverized coal 25.0 kg/nr
Position of main-lance
Over hath surface
Molten from temperature
on discharge to gasifier
on coal gasifier con coal gasifier 1500 °C
Sasicity of slug 1.5
Weight of coal 200 Kg

€ € COAL SAMPLE - D

Proximate	analysis	Proximate analysis Ultimate analysis	analysis	Ash components	nts
Noisture	કર	<u>5</u> ج		\$ \$102	` ≥ ₹
Ash	≥ ₹	五	98	A1203	\$-5
V.W.	ે€	Z	⊱ €	Ça O	5.5
ن ن	3.8	0	34	K20	≵ -€
T S	2.6			Na20	3-₹

	NEC/CHI
riow rate of carrier gas	Na3/hr
Flow rate of pulverized coal	kg/hr
Position of main-lance	
over bath surface	
Molten from temperature	
on discharge to gasifier	ပ္င
on coal gasification	ပ္
on dischare to pot car	ပ္
Sasicity of stag	-
Weight of coul-	ver Ke
Weight of Durnt lime	: <u>%</u>



RUN NO. CGOII 11th coal gasification test run

1.PURDOSE of RUN
1) Investigation of gasification-characteristics
2) for ESIVAL BUIAL and SIJ cool

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Ash components E. F. 19.0 E. E. F. 19.0 E. E. F. 18.55 E. 55.5555 Proximate analysis | Ultimate analysis BSIA1 & BSIA Moisture Ash V.M. F.C. Sulin

OPERATION CONDITION-A

wet Kg Kg NE3/hr %\$/hr 8555 NS Weight of molten from Flow-rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance over talk surface Moiten iron temperature on discharge to gasifier on dischare to pot car on coal sasification Basicity of slag Weight of cout Weight of burnt line

1987.10.09 · (Fr.)

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COAL SAYPLE - B

Ash components 76.73 Proximate analysis Ultimate analysis BUTA1 7.08 #1.92 #8.02 Manight Comments Moisture 7.0.F

Weight of molten iron		300	88
Flow rate of Oxygen		16.	NICOL.
Flow rate of carrier gas		10.0	NH3/hr
Flow rate of pulverized coal		25.0	K2/hr
Position of main-fance		200	Hid
over bath surface			
Motten from temperature			
on discharge to gasifier		1 1	دغ
on coal gasification		1500	<u>ن</u> -
on dischare to pot car	,A	1	نړ
Basicity of stag	:	7.	
Weight of coal		75	vet K:
Weight of burnt lime		0	.‰

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1987.10.09 . (所)

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1.PURPOSE of RUN 1) 2)

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—C

COAL SAMPLE - D

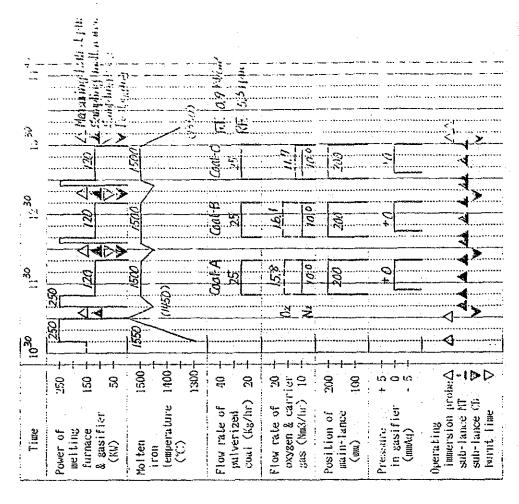
	S	७९ ७९ ३९ ७२ ३२
	Ash components	S 102 A 1203 Ca0 K 20 Na20
	analysis	67.83 % 5.67 % 1.06 % 25.78 % 0.26
SJJ	Ultimate	OHZOW
aber	Proximate analysis Ultimate analysis	1.95 47.78 40.77 40.77
Sample number	Proximate	Moisture Ash V.M. F.C.

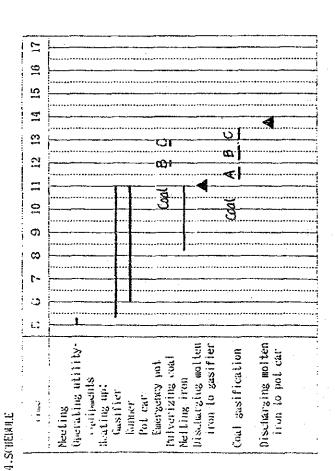
OPERATION CONDITION - C

Weight of moiten iron	300	X S
Flow rate of Oxygen	11.7	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance	200	
over bath surface		
Molten iron temperature		
on discharge to gasifier	,	ပ
on coal gasification	1500	ပူ
on dischare to pot car	1350	Ų
Basicity of slag	 	
Weight of coal	9/	wet Kg
Weight of burnt lime	C	3

Sample number	nber				٠.
Proximate	analysis	Ultimate	analysis	Proximate analysis Ultimate analysis Ash components	sause
Moisture Ash V.M. F.C.	ठे १ ठे १ ठे२ ठे१	OHNO	\$6 \$6 \$6 \$4	Si02 A1203 Ca0 K20 Na20	36 36 36 36 36

Weight of molten iron	3X
Flow rate of Oxygen	Nm3/hr
Flow rate of carrier gas	N#3/hr
Flow rate of pulverized coal	K&/hr
Position of main-lance	ETAS .
over bath surface	
Molten iron temperature	
on discharge to sasifier	ပ္
on coal gasification	ņ
on dischare to pot car	پ
Basicity of slag	
Weight of coal	wet Kg
Weight of burnt lime	KS





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		TEST RUN	
		2 TH COAL GASIFICATION	
		CASIF	
		¥ COAL	
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1987.10.15 · (Thu.)

DATE

1. PURPOSE of RUN
1) INVESTIGATIONS OF CASIFICATION-CHARACTERISTIC for BUMB2, BSIC1 and BSIVB coal

2. COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A.

Ash components Proximate analysis Ultimate analysis BUIL 82 CHRON 2.23 47.53 50.13 % % Sample number Ash V.M. F.C.

(0.A.F) (DRY BASE)

OPERATION CONDITION-A

wet Kg Kg Kg Nm3/hr Nm3/hr Kg/hr mm 300 10.0 20.0 20.0 1550 1500 1.5 78 0 on discharge to gasifier on coal gasification on discharge to pot car Basicity of slag Weight of coal Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance Moiten iron temperature Weight of molten iron over bath surface

COAL SAMPLE - B

		केद केद केद केद
	Ash components	S102 A1203 Ca0 K20 Na20
BSICL	Ultimate analysis	C 76.41 % H 5,83 % N 1,40 % O 15.76 % S 0,60 %
Sample mumber	Proximate analysis Ultimate	Ash 2,65 % V.M. 46,95 % F.C. 50,40 %

(D.A.F.) (DRY BASE)

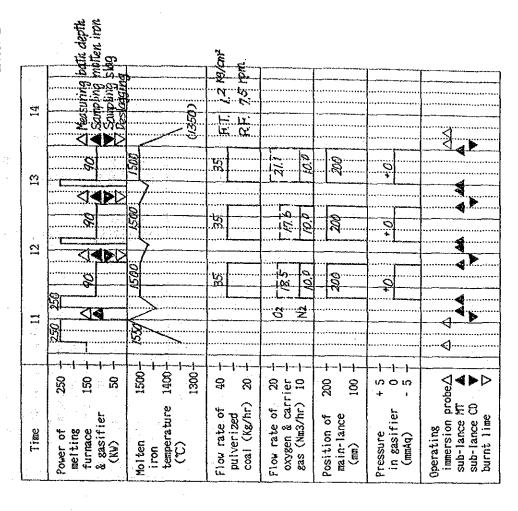
Weight of molten iron	300	83
Flow rate of Oxygen	191	Net 3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	30.0	Kg/hr
Position of main-lance	8	1212
over bath surface		
Molten iron temperature		
on discharge to gasifier	t ;	ပူ
on coal gasification	1500	ņ
on discharge to pot car	,	ţ
Basicity of slag	1.5	
Weight of coal	8/	wet Kg
Weight of burnt lime	0	Κg

Γ		7
	CC012	
	RUN NO.	
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COAL SAMPLE - C

Sample number		ветв			
mate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash	Ash components
Ash V.M.	7.7.7.25 4.8.26 4.8.26 4.8.26	UEZON	1. 7. 7. 2. 0. 1. 4. 1. 0. 0. 1. 4. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	Si 02 A1203 Ca0 K20 Na20	১ ୧ ৯୧ ৯ ୧ ৯ ୧
	(DRV BASE)		(0.A.F)		

	300	К8
Flow rate of Oxygen	18.0	Nm3/hr
Flow rate of carrier gas	10.0	Nn3/hr
Flow rate of pulverized coal	9 8	Kg/hr
Position of main-lance	200	
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	Ç
on coal gasification	1500	Ç
on discharge to pot car	1350	္န
Basicity of slag		
Weight of coal	17.	vet Kg
Weight of burnt lime	0	% %



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<u>=</u>	ecting equipments ating up: design up: desig
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	Meeting Operating utility- equipments Heating up: Gasifier Runner Pot car Emergency pot Pulverizing coal Melting iron Discharging molten iron to gasifier Coal gasification Discharging molten iron to pot car
7 1	≭ర్జ్ జెక్ బెక్స్ ర్స్

TEST000-1

50013 RUN No. 13 TH COAL GASIFICATION TEST RUN \$

1987.10. 20 . (Tue)

DATE

1-PURPOSE of RUN
1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for BUIA2, BUIIC2 and BUIIB1

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A.

	ाहि इस्	३६ ३६ ३६ ३६
1	Ash components	Si 02 Al 203 Ca 0 K20 Na 20
BUIA2, BUIA2	Ultimate analysis	NHN N N N N N N N N N N N N N N N N N N
Sample number	Proximate analysis Ultimate analysis	Ash 3.29 % V.M. 46.08 % F.C. 50.63 %

(DRY BASE)

(D.A.F)

OPERATION CONDITION-A

wet Kg Kg Kg N#3/hr N#3/hr Kg/hr 300 18.5 10.0 35.0 200 1500 1500 Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance on discharge to gasifier on coal gasification on discharge to pot car Molten iron temperature Basicity of slag Weight of coal Weight of burnt line Weight of molten iron over bath surface

COAL SAMPLE - B

Sample number	aber	BuIIC1			
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	
Ash V.M. F.C.	7.90 % 46.04 % 52.06 %	UHZON	74.50 5.436 1.36 24 0.45 24 25 25 25 25 25 25 25 25 25 25 25 25 25	Si02 A1203 Ca0 K20 Na20	क्ष कर कर कर कर

(0.A.F.) (DRY BASE)

Weight of molten iron	300	_
Flow rate of Oxygen	9,77	
Flow rate of carrier gas	10.0	:
Flow rate of pulverized coal	35.0	K&/hr
Position of main-lance	200	
over bath surface		
Molten iron temperature		
on discharge to gasifier	1	
on coal gasification	1500	ပူ
on discharge to pot car	1	رړ
Basicity of stag	.5.	
Weight of coal	21	wet Kg
Weight of burnt lime	0	K8

CG013	
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25	
RUN	

Sample number BUILBI, BUIVBI, BUVBI

Proximate analysis Ultimate analysis Ash components

Ash 408 % C 73.6% A1203

V.M. 4592 % H 5.69 % A1203

F.C. 50.60 % N 1.20 % Ca0

1.20 % Ca0

8 97 % K20

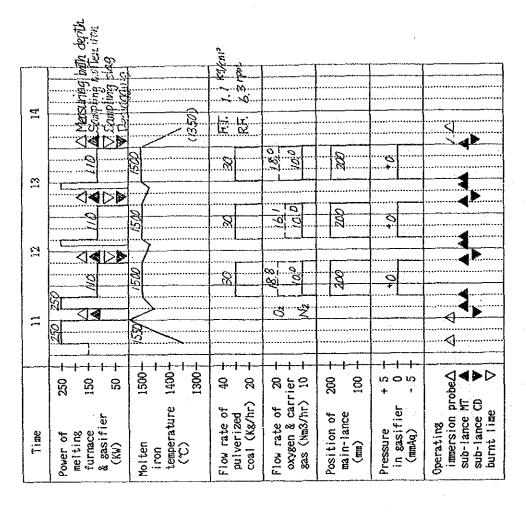
8 0 18.97 % K20

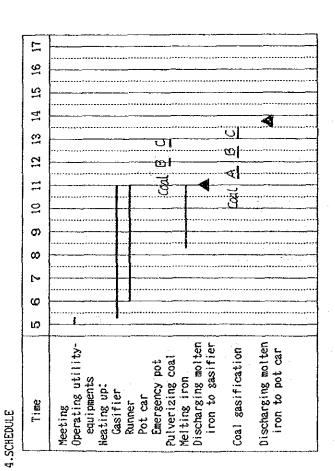
8 S 0.95 % Na20

8 0.95 % Na20

COAL SAMPLE - C

OFEMALIUM CUMBILLUM - C	'		
Weight of molten iron	300	Kg	
Flow rate of Oxygen	21.1	Nn3/hr	
Flow rate of carrier gas	10.0	Nm3/hr	-
Flow rate of pulverized coal	35.0	Kg/hr	
Position of main-lance	200	1171	
over bath surface			
Molten iron temperature			
on discharge to gasifier	#550	ಭ	
on coal gasification	1500	ړ	
on discharge to pot car	1350	ņ	
Basicity of slag	1.5		
Weight of coal	71	wet Kg	
Weight of burnt lime	0	**	
_			





1987.10.23 (Fri)

DATE

CC014				r 	 					
RUN No.	for	•		components	94 94	ठ <i>६ ३६</i> ३ २			K8 Nm3/br K8/br CC mm 7,br vet K8	× × ×
RUN	RPOSE of RUN 1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for CBB1, CBC and SJJ			Ash compo	S102 A1203	Ca0 K20 Na20			300 74.4 10.0 35.0 200 1550 1550 1.5	0
14 TH COAL GASIFICATION TEST RUN	AT10N-CHAR	TION		analysis		20.73 se	(D.A.F)	-		
AL GASIFIC	of GASIFIC SJJ	TION CONDI	CBR1	Ultimate analysis	υ¤	Zon		۷-	iron ier gas ier gas erized coal lance face trature to gasifier ication to pot car	۵)
74 TH CO	E of RUN INVESTIGATIONS OF G CBBJ, CBC, AND, SJJ	2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A.		analysis	5.79 8	47.09 %	(DRV BASE)	OPERATION CONDITION-A	Se	burnt lime
KUN.	1.PURPOSE of RUN 1) INVESTIGA CBB1, CB	COAL SAMPLE	Sample number	Proximate analysis	Ash V.M.	<u>ئ</u>		OPERATION	Weight of molten Flow rate of car Flow rate of pul Position of main over bath su Molten iron temp on discharge on coal gasi on discharge un discharge	weight of
	<u>a.</u>	2.	استنجا		i)		L.,	

Ks Nm3/hr Nm3/hr Kg/hr

300 74.5 10.0 35.0 200

Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal

Position of main-lance over bath surface

Ash components

Proximate analysis Ultimate analysis

CBC

Sample number

COAL SAMPLE - B

OHZON

26.73 5.85 5.8555

Ash V.M. (D.A.F.)

(DRY BASE)

OPERATION CONDITION - B

wet Kg Kg

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1500

Molten iron temperature
on discharge to gasifier
on coal gasification
on discharge to pot car
Basicity of slag
Weight of coal

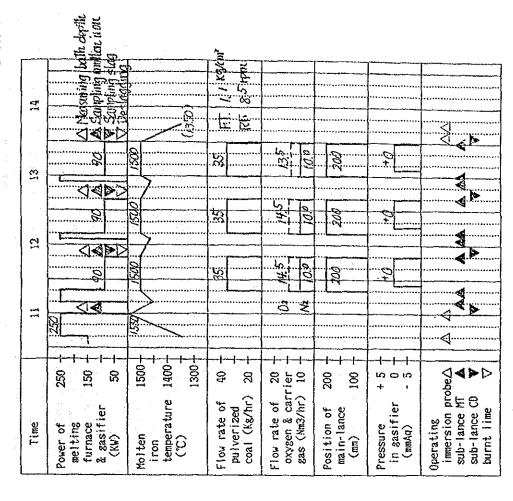
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	RUN No.	
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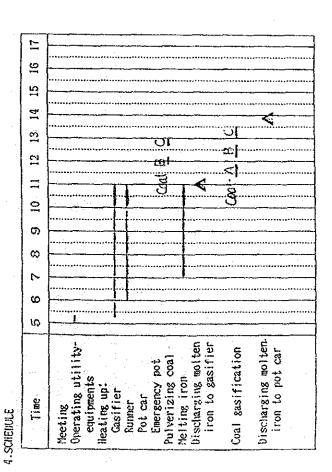
COAL SAMPLE-C

	2	7			
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash	Ash components
Ash V.M. F.C.	1,95 47,28 47,28 40,077 80 80 80 80	OHZON	67.83 5.67 1.06 25.18 0.26 88	Si 02 A1203 Ca0 K20 Na 20	क्ट केद के द के द

(DRV BASE)

Weight of molten iron	300	¾
Flow rate of Oxygen	13.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance	200	THE
over bath surface		
Molten iron temperature		
on discharge to gasifier	1030	ပူ
on coal gasification	1500	ပူ
on discharge to pot car	1350	ပ္
Basicity of slag	1.5	
Weight of coal	7]	wet Kg
Weight of burnt lime	0	K8





TEST000-1

CC015 RUN No. 15 TH COAL GASIFICATION TEST RUN 5

1987.10.27 . (Tue.)

DATE

1. PURPOSE OF RUN
1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC FOR AR, CBB2 and AL

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Sample number	AR		
Proximate analysis	re Fe	Ash components	
Ash 2.25 % C V.M. 47.79 % H F.C. 49.76 % N S	C 77.73 38 10.00 1	Si02 A1203 Ca0 K20 Na20	34 34 34 54 3 4

(DRY BASE)

(D.A.F)

OPERATION CONDITION-A

Weight of molten iron		300	%
Flow rate of Oxygen		84/	Nm3/hr
Flow rate of carrier gas		10.0	Nm3/hr
Flow rate of pulverized coal		35.0	Kg/hr
Position of main-lance		200	H
over bath surface			
Moiten iron temperature			
on discharge to gasifier		1550	ပူ
on coal gasification		200	ပ္
on discharge to pot car		ļ	ပ
Basicity of slag		.5	•
Weight of coal	?	22	wet Kg
Weight of burnt lime			<u>\$</u>

COAL SAMPLE - B

Sample number	mber	CBBI	-	-	
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	ents
Ash V.M. F.C.	5.96 x 46.15 x 47.89 x	OHZON	73.08 5.73 1.24 0.34 2.42 0.35 3.42 3.42 3.42 3.43 3.43 3.43 3.43 3.43	Si02 A1203 Ca0 K20 Na20	96 96 96 96

(D.A.F.) (DRY BASE)

Weight of molten iron	.,	300	Ke Viro
בוסא ושוב מו האאצבוו		È	VIII COM
Flow rate of carrier gas		10.0	Va3/hr
Flow rate of pulverized coal		Ķχ	Kg/hr
Position of main-lance		200	1
over bath surface			
Molten iron temperature			
on discharge to gasifier		ţ	ţ
on coal gasification		1500	دړ
on discharge to pot car		1	ပူ
Basicity of slag	:	.5	
Weight of coal		21.	wet Kg
Weight of burnt lime	:	0	\$ 2

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N N		
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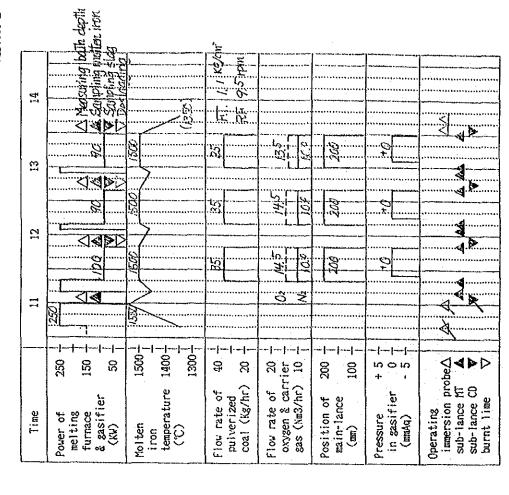
COAL SAMPLE - C

Sample Hamper		AL			
Proxima	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash	Ash components
Ash 7.C.	7.7.7 7.9.9 7.9.9 7.9.9 7.9 7.9 7.9 7.9	UEZOM	52.72 5.72 7.03 56.83 56.86 56.96 56	S102 A1203 Ca0 K20 Na20	> ? >

(DRY BASE) (0.A.

Weight of molten iron	300	% 8
Flow rate of Oxygen	13.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance	200	шш
over bath surface	,	
Molten iron temperature		
on discharge to gasifier	1550	ပ္
on coal gasification	1500	ပ
on discharge to pot car	1350	ပ္
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	0	% %

4-SCHEDULE



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Time	Meeting Operating utility- equipments Gasifier Runer Pot car Emergency pot Pulverizing coal Melting iron Discharging molten iron to gasifier Coal gasification Discharging molten iron to pot car

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RUN NO.	
TH COAL GASIFICATION TEST RUN	
RUN /6	

1987.16. 30 . (Fri.)

DATE

1. PURPOSE of RUN
1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC for BSIA2, STEL and CBA2

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A.

Sample number		BSIA2			
Proximate	ana lysis	Proximate analysis Ultimate analysis	analysis	Ash components	nents
Ash V.M. F.C.	4,75,47	OHZON	75.73 7.73 7.03 2.23 2.23 2.23 2.23 2.23 2.23 2.23 2	Si02 A1203 Ca0 K20 N220	३६ ३६ ३६ ३६
	(DRY BASE)		(D.A.F)		

OPERATION CONDITION-A

Weight of molten iron	300	K3
Flow rate of Oxygen	1,91	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance	200	E
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	Ų
on coal gasification	1500	ပ္
on discharge to pot car	ŀ	ပ္
Basicity of slag	1.5	
Weight of coal	22	wet Ks
Weight of burnt lime	0	© 2≤

COAL SAMPLE - B

Sample number	nber	SJE1			
Proximate	Proximate analysis	Ultimate analysis	analysis	Ash components	nents
Ash V.M. F.C.	7,49	OHNON	70.32 % 5.90 % 1.03 % 22.51 % 0.24 %	S102 A1203 Ca0 K20 Na20	३६ ३६ ३६ ३६ ३ ६

(0.A.F.) (ORY BASE)

1) - : - : - : - : - : - : - : - : - : -	0	1
Weight of molten from	20%	9
Flow rate of Oxygen	13.5	NEG/11
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance	200	in in
over bath surface		
Molten iron temperature		
on discharge to gasifier		رړ
on coal gasification	1500	دړ∙
on discharge to pot car	ŧ	ţ
Basicity of slag	13.	,
Weight of coal	21.	vet Kg
Weight of burnt lime	0	- 60 24
		,

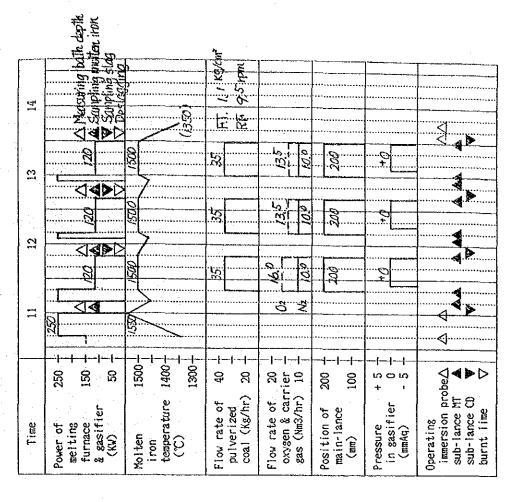
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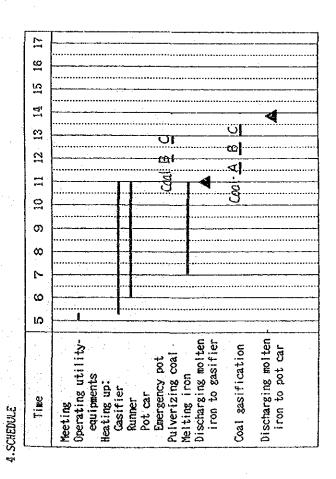
COAL SAMPLE - C

Sample number	CBA2			
ate a	s Untimate	analysis	Ash co	Ash components
Ash 10.94 % V.M. 45.01 % 45.01 % H.L.O. 44.05 %	OHZOM	71,56 5.73 1.16 21.20 0.35 0.35	S 102 A 1203 Ca 0 K20 Na 20	ठेर ठेर ठेर ठेर ठेर

(DRY BASE)

Weight of molten iron	:	300	∞ 2
Flow rate of Oxygen		w m	Nm3/hr
Flow rate of carrier gas		10.0	N#3/hr
Flow rate of pulverized coal		35.0	K8/hr
Position of main-lance		200	mm
over bath surface			
Molten iron temperature			
on discharge to gasifier		1556	ပ္စ
on coal gasification		1200	ပ္
on discharge to pot car		0350	္ခ
Basicity of slag		1.5	
Weight of coal	:	21.	wet Kg
Weight of burnt lime		0	×××





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RUN	,

1987.11. 5 . (Thu.)

DATE

1.PURPOSE OF RUN
1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC FOR
CBA2, SJE2 and CBA1 coal.

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Sample number		CBA2	:		
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	ents
Ash V.M. F.C.	10.94 45.01 44.65 8 88 88 44.65 8 0 N	OHZOW	77.56	Si 02 A 1203 Ca 0 K20 Na 20	२९ ३ ९ ३९ ३९ ३९

(DRY BASE)

OPERATION CONDITION-A

Weight of molten iron	300	Ж 2	
Flow rate of Oxygen	13.3	Nm3/hr	
Flow rate of carrier gas	10.0	Na3/hr	
Flow rate of pulverized coal	35.0	Kg/hr	
Position of main-lance		蘳	
over bath surface			
Molten iron temperature			
on discharge to gasifier	1550	Ç	
on coal gasification	1500	ပ္	<u> </u>
on discharge to pot car		ņ	
Basicity of slag	2.5		
Weight of coal	1	wet Kg	
Weight of burnt lime	0	**	•

COAL SAMPLE - B

Sample number	nber	SJE2		
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components
Ash V.M. F.C.	2, 68 50 15 47.77 47.77	OHZON	22.56 22.56 22.56 22.56 22.56 23.56	Si02 A1203 Ca0 K20 Na20

(D.A.F.) (DRY BASE)

300 Ke		10.0 Na3/hr	1	200			پ	1500 1500	រូ <u></u> ្	1.5	22 vet Kg	O O
Weight of molten iron	Flow rate of Oxygen	Flow rate of carrier gas	Flow rate of pulverized coal	Position of main-lance	over bath surface	Moiten iron temperature	on discharge to gasifier	on coal gasification	on discharge to pot car	Basicity of slag	Weight of coal	Weight of burnt lime

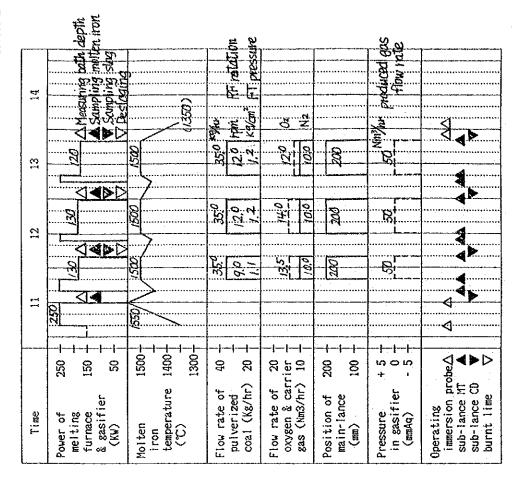
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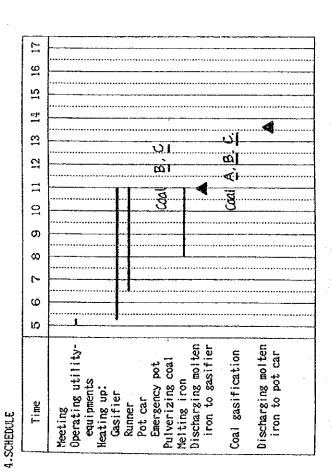
COAL SAMPLE - C

Compute Hamper	mber	CBA1			
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash co	Ash components
Ash V.M. F.C.	77.03 42.73 40.24 88.88 88.88	OHZON	69.68 5.76 7.12 21.81 1.71 33333333	Si02 A1203 Ca0 K20 Na20	36 36 36 36 36

(DRV BASE) OPERATION CONDITION—C

Weight of molten iron	300	×.
Flow rate of Oxygen	8:11	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	350	Kg/hr
Position of main-lance	200	mm
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	ပ္
on coal gasification	1500	ပ္
on discharge to pot car	1350	ပူ
Basicity of slag	1.5	
Weight of coal	21.	wet Kg
Weight of burnt lime	٥	K8





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Control of the Contro	RUN NO.	
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	L GASIFICATIO	
	7 TH COAL	
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1987.11.12 . (Thu.)

DATE

1. PURPOSE OF RUN
1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC FOR BJS and BUILCI coal.

2. COAL SAMPLE and OPERATION CONDITION COAL SAMPLE - A.

Sample number	nber	BJS			
Proximate	analysis	Proximate analysis Ultimate	analysis	Ash components	suts
Ash V.M. F.C.	47.4 49.97 34 25.73 34 34 34	OHZON	28.52 24.05 24.05 24.05 25.05	Si 02 A1203 Ca0 K20 Na20	३६ ३६ ३६ ३६ ३६

(DRY BASE)

(D.A.F)

OPERATION CONDITION - A

Weight of molten iron	300	K8
Flow rate of Oxygen	13.3	N#3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	350	Kg/hr
Position of main-lance	500	開
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	ပူ
on coal gasification	1500	ပ္
on discharge to pot car	ļ	ပ္
Basicity of slag	1.5	
Weight of coal	28	wet Kg
Weight of burnt lime	0	χ 8

COAL SAMPLE - B

	6	इंश्वेष्ट्रेश्डेश्डेश
	Ash components	Si 02 A 1 2 03 Ca 0 K2 0 Na 2 0
	AS	25028
	analysis	77, 50 5,43 1,36 1,36 1,45 1,45 1,45 1,45 1,45 1,45 1,45 1,45
BullCl	Ultimate analysis	OHZON
umber	Proximate analysis	76.95 52.06 52.06 53.06 53.06
Sample number	Proximat	Ash V.H. F.C.

(0.A.F.) (DRY BASE)

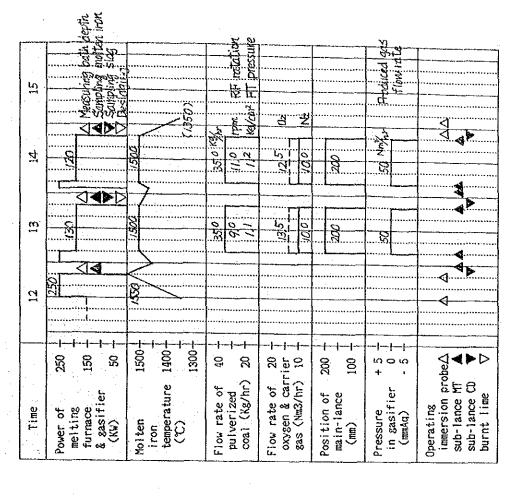
Weight of molten iron	300	00
Flow rate of Oxygen	12.6	NE3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Ks/hr
Position of main-lance	200	1171
over bath surface		
Moiten iron temperature	٠	
on discharge to gasifier	1	ပူ
on coal gasification	1500	ပူ
on discharge to pot car	1350	ಭ
Basicity of slag	.55	
Weight of coal	27.	vet Kg
Weight of burnt lime	O	ж 80

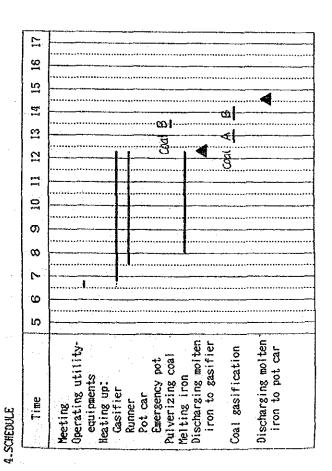
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COAL SAMPLE -- C

Proximate analysis	analysis			Ash components
Ash V.M. F.C.	३९ ३९ ३९ ३९	UHZOV	Si02 A1203 Ca0 K20 Na20	৯ ୧ ৯ ୧ ৯୧ ৯

Weight of molten iron	300	κς 2
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance	200	ETECT
over bath surface		
Moiten iron temperature		
on discharge to gasifier	1550	ပ္
on coal gasification	1500	ပူ
on discharge to pot car		پ
Basicity of slag	17	
Weight of coal		wet Kg
Weight of burnt lime	0	<u>%</u>





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	9 TH COAL GASIFICATION TEST RUN	
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1.PURPOSE OF RUN
1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC for BIS and ESIAL cost

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Sample number	mber	BJS			
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	
Ash V.M. F.C.	45,97 45,97 45,97 45,97	ORZON	59.52 74.15 55.52 74.13 6.52 888888888888888888888888888888888888	S102 A1203 Ca0 K20 Na20	अर अर अर अर अर
	(ORY BASE)		(D.A.F)		

OPERATION CONDITION-A

Weight of molten iron	300	K8
Flow rate of Oxygen		N#3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	0.35	Kg/hr
Position of main-lance	200	H
over bath surface		
Molten iron temperature		
on discharge to gasifier	1550	μ
on coal gasification	1200	ပ
on discharge to pot car	1	ပူ
Basicity of slag	 .55	* .
Weight of coal	22	wet Kg
Weight of burnt lime	0	\$ %

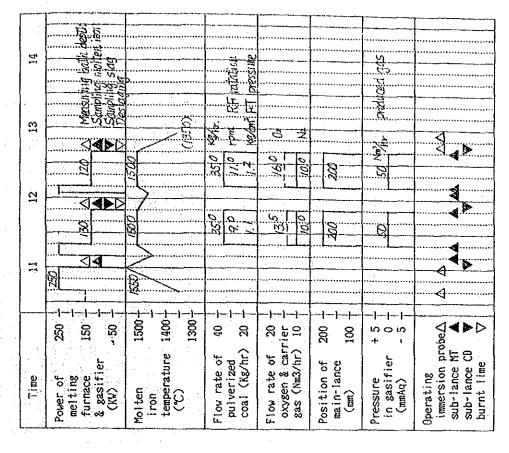
1987.11.18 · (Wed.) DATE

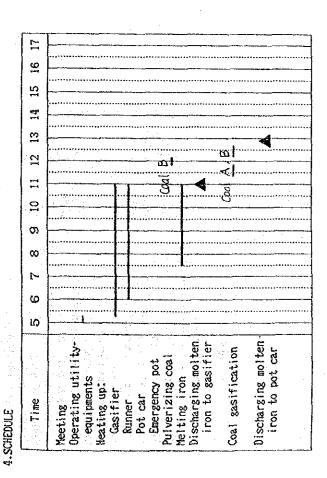
COAL SAMPLE - B

Sample number		BSIAI			
Proximate	Proximate analysis Ultimate	Ultimate	analysis	Ash components	
Ash V.M. F.C.	22 24 14 26 24 26 27 24 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27 2	OEZON	73.13 % 19.26 % 19.26 % 10.71 % 00.71 %	S102 A1203 Ca0 K20 Na20	३१ ४९ ३ ९ ५ २ ३९

(0.A.F.) (DRY BASE)

300 Ks /5.8 Nm3/hr 10.0 nm3/hr	35.0 Kg/hr 200 am	200 st	1.5 vet Kg 2/. Kg
Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas	Flow rate of pulverized coal Position of main-lance	over bath surface Volten iron temperature on discharge to gasifier on coal gasification	Rasicity of slag





TEST000-1

26. Nov. 87

CC01 - 20 RUN No. TH COAL GASIFICATION TEST RUN

1987.10

DATE

3

1. PURPOSE of RUN

1) INVESTIGATIONS OF GASIFICATION-CHARACTERISTIC FOR

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A.

Sample number	umber 8548	48			
Proximate	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	nts
ASh V.N. F.C.	4.49 47.25 % 48.26 %	OHZON	说 u - g, o	Si02 A1203 Ca0 K20 Na20	उद २६ २६ २६ २६
	(ORY BASE)		(D.A.F)		

OPERATION CONDITION - A

	Weight of molten iron	300	2	
	Flow rate of Oxygen	Ñ	Nm3/hr	
	Flow rate of carrier gas	10-0	Nm3/hr	
	Flow rate of pulverized coal	ë V	Kg/hr	
	Position of main-lance	200		
	over bath surface			
	Molten iron temperature			
	on discharge to gasifier	1550	ပ	
	on coal gasification	1500	Ų	
,	on discharge to pot car	(ပွဲ	
-	Basicity of slag	1.5		
	Weight of coal	त	wet Kg	
	Weight of burnt lime	0	.99	

COAL SAMPLE—B

		3 t 3 t 5 t 3 t 5 t
	Ash components	S102 A1203 C20 K20 K20
Buzba	Itimate analysis	C 73.10 % NN 1.25 % S 18.15 % S 1.75 %
Sample number Bu	Proximate amlysis Ultimate analysis	Ash 229 37 2 8

(D.A.F.)

(DRY BASE)

OPERATION CONDITION—B

138 on discharge to gasifier on coal gasification on discharge to pot car Basicity of slag Weight of coal Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance Molten iron temperature over bath surface

1987. to 26 . (Thu.)

COAL SAMPLE - 15

Proximate	Proximate analysis Ultimate analysis	Ultimate	aralysis	Ash components	
Ash V.M. F.C.	7-06 22 44-92 22 22 22 22 22 22 22 22 22 22 22 22 2	OHRON	5-973: 5-973: 15-49: 0-59:	S:102 A1203 C20 K20 N220	36 36 36 36 36

(DRY BASE) (0.A.F.)

OPERATION CONDITION—B

Veight of molten iron 16.1 Nm3/hr 16.1 Nm3/hr 16.0 rate of carrier gas 10.0 Nm3/hr 16.0 rate of carrier gas 15.0 Rg/hr 16.0 rate of pulverized coal position of main-lance over bath surface Nolten iron temperature on discharge to gasifier on discharge to pot car 15.5 Resicity of slag Veight of burnt lime 16.1 Nm3/hr 1

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			_				_	- 1	•	oxygen & carrier gas (N¤3/hr) 10	١.			1			sub-lance MT	8
Time	of ing	& gasifier (KV)	ç	iron temperature	`	rate	pulverized	١	ate	2 K		osition of		<u> </u>	sifi((d)	gu:	arice arice	sub-lance
•	Power of melting furnace	& gas (KV)	Mol ten	iron tempe	2	Flow rate of	2 S		Flow rate of	900 880 880		rosition of	E	Pressure	in gasifier (mmAq)	Operating	Sub-lance M	-das

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1987-12.2.

DATE

1. PURPOSE of RUN

1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for BSIC1

2-COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A.

COAL SAMPLE—B

Sample number BSIC1	צונו		
Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components
Ash 0.265 % V.M. 46.95 % F.C. 50.40 %	OHNON H	下で一下。 2 2 4 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Si02 Al203 % Ca0 % K20 Na20 %
(ORY BASE)		(b.A.F)	

(DRY BASE)

	000	
weight of motten from	3	2
Flow rate of Oxygen	4.	Nn:3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35	Ka/hr
Position of main-lance	200	1111
over bath surface		
Nolten iron temperature		
on discharge to gasifier	1550	ပူ
on coal sasification	1200	ပူ
on discharge to pot car		ပ
Basicity of slag	1.5	
Weight of coal	2	wet Kg
Weight of burnt lime	0	7. 00

		3436363636
	Ash components	S102 A1203 Ce0 K20 Na20
	Proximate analysis Ultimate analysis	## # # # # # # # # # # # # # # # # # #
Burct	Ultimate	OHMON
1 .	analysis	1.90
Sample number	Proximate	Ash V.M. F.C.

(0.A.F.) (ORY BASE)

Weight of molten iron 300 Kg Flow rate of Oxygen Flow rate of carrier gas 10.0 Nm3/hr Flow rate of carrier gas 35 Kg/hr Position of main-lance over bath surface Molten iron temperature on discharge to gasifier on coal gasification on discharge to pot car on discharge to pot car list weight of coal 20 wet Kg Weight of burnt lime 0 Kg				
ten iron Mayen Marrier gas Walverized coal Walverized coal Warface Maperature We to gasifier Sification We to pot car Ag time	Ke N#3/hr N#3/hr	Kg/hr Em	ಭಭಭ	wet Ks Ks
Weight of molten iron Flow rate of Oxygen Flow rate of carrier gas Flow rate of pulverized coal Position of main-lance over bath surface Molten iron temperature on discharge to gasifier on coal gasification on discharge to not car Basicity of slag Weight of coal	300,	35 200	1500	20 00
文化化化仪 茨 咒苦苦	eight of molten iron low rate of Oxygen low rate of carrier gas	ow rate of pulverized coal sition of main-lance over bath surface	on discharge to gasifier on coal gasification on discharge to pot car	sicity of slag light of coal light of burnt lime

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	RUN NO.	
the same of the sa	TH COAL GASIFICATION TEST RUN	
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1987-12.2. (

DATE

I.PURPOSE of RUN
I) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for

2.COAL SAMPLE and OPERATION CONDITION COAL SAMPLE—A

Sample number	mber				
Proximate a	Proximate analysis Ultimate analysis	Ultimate	analysis	Ash components	nents
Ash V.M. F.C.	७२ ३२ ३२ ३१	OEZON	34 54 34 54 54	S102 A1203 Ca0 K20 Na20	96 56 95 56 9 6
	(DRY BASE)		(0.A.F)		

OPERATION CONDITION-A

Kg Nm3/hr Nm3/hr vet Ks Ks Kg/hr 10.0 1550 8 ស្ន Weight of molten iron
Flow rate of Oxygen
Flow rate of carrier gas
Flow rate of pulverized coal
Position of main-lance
over bath surface on discharge to pot car basicity of slag Veight of coal Veight of burnt lime Molten iron temperature on discharge to gasifier on coal gasification

COAL SAMPLE-6 CBC

Sample number	aber				
Proximate	analysis	Proximate analysis Ultimate analysis	analysis	Ash components	,,
Ash V-M. F.C.	44.6.5 44.8.5 46.43 46.4	OEMON	4 8 8 8 4.4.	S102 A1203 Ce6 K20 K20	96 96 96 96

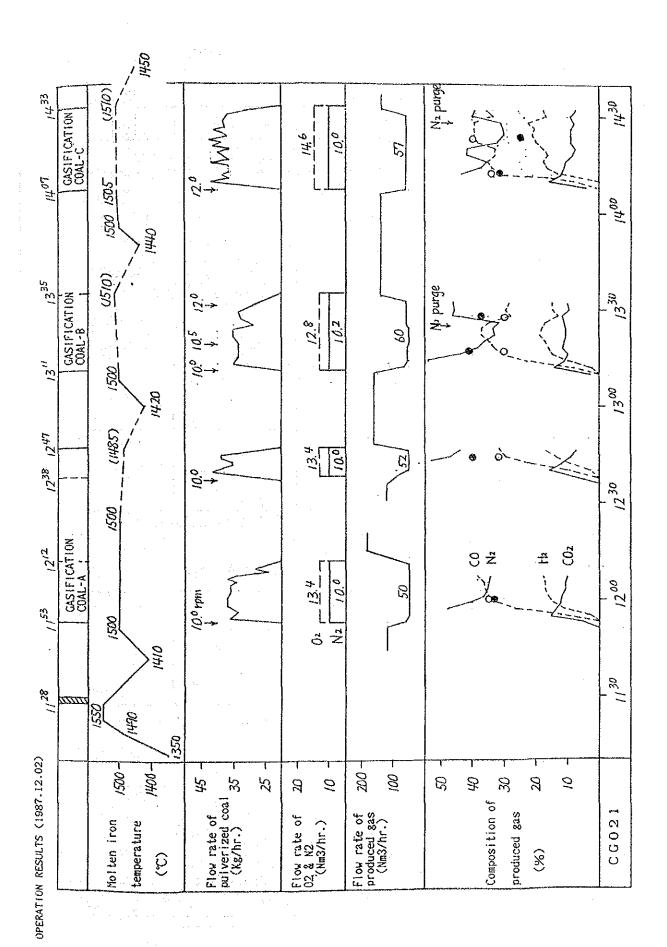
(0.4.F.) (ORY BASE)

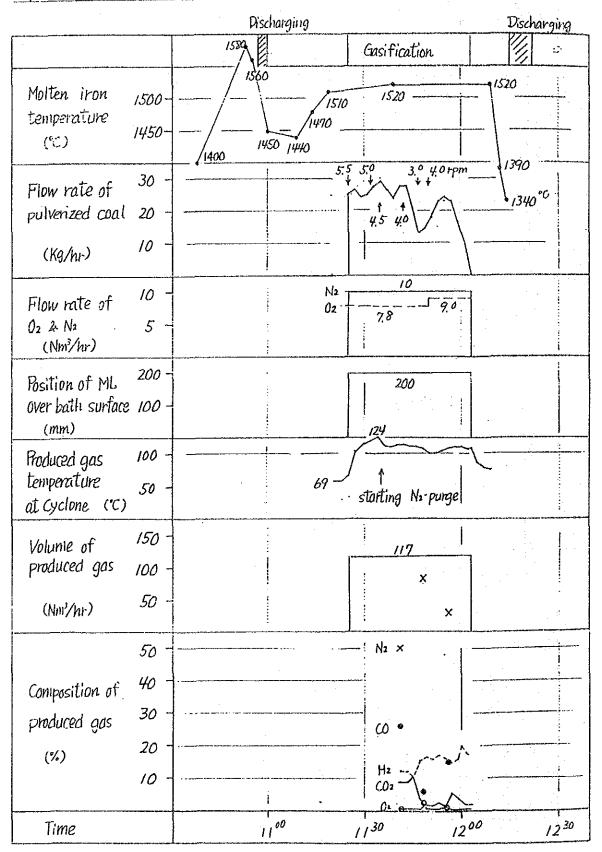
300 Kg 14.5 Nm3/hr	10.0						1500	0961	1.5	30 vet Kg	0 Kg	
Weight of molten iron Flow rate of Oxygen	Flow rate of carrier gas	Flow rate of pulverized coa	Position of main-lance	over bath surface	Molten iron temperature	on discharge to gasifier	on coal gasification	on discharge to pot car	Basicity of slag	Weight of coal	Weight of burnt line	

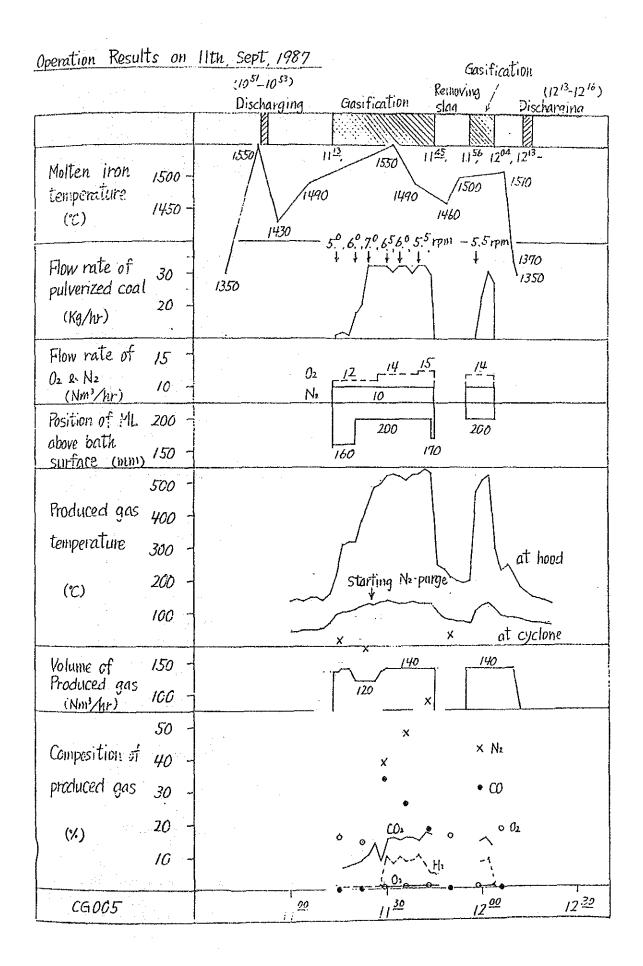
	Sampling Sage		RF 701.	Nm3/81		- G) No.	
 	\$ \$ \$ \$ 4 ▶ ▷	8	Park Of relation 19/6- FT pressure	/c.w.y	E	Na/fr Produced gas Thou-rate	4
	8	<u>R</u>	3.0 m	5 0	200	ß	
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					-1-1-1-		
	250 150 50	1500	40	rrier > 10	200 -	4 + 1	obe∆ •
Time	Power of melting furnace & gasifier (KW)	Molten iron temperature (C)	Flow rate of pulverized coal (Kg/hr)	Flow rate of 20 oxygen & carrier gas (Nm3/hr) 10	Position of main-lance (mm)	Pressure in gasifier (mmAq)	Operating immersion probe∆ sub-lance MT ★ sub-lance CO ▼

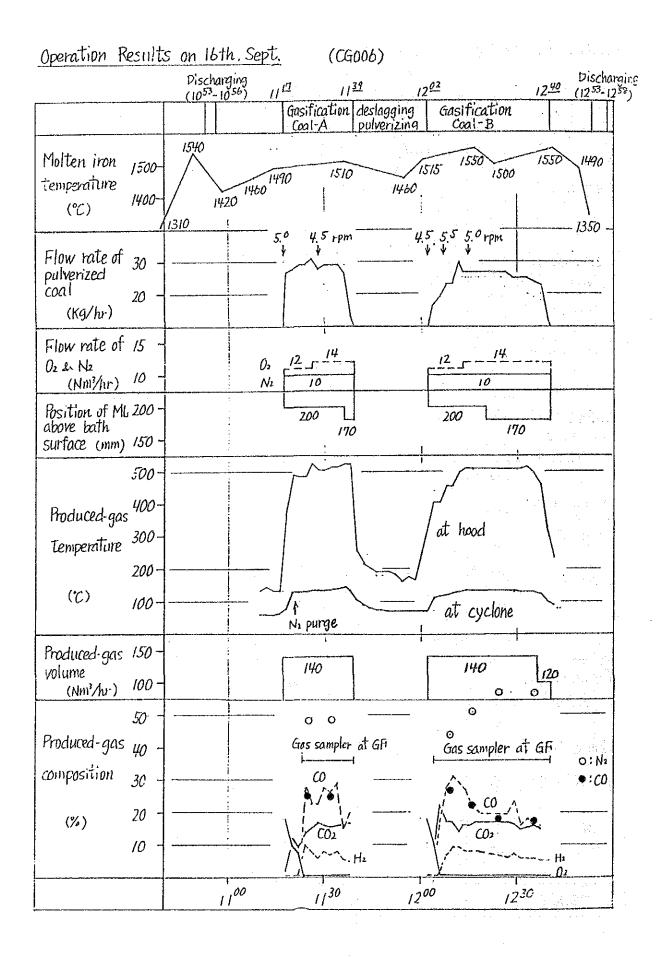
Time 55 8	Meeting Operating utility- equipments Heating up: Gasifier Runner Pot car Emergency pot Alverizing coal Melting iron Discharging molten iron to gasifier Coal gasification Discharging molten iron to pot car				
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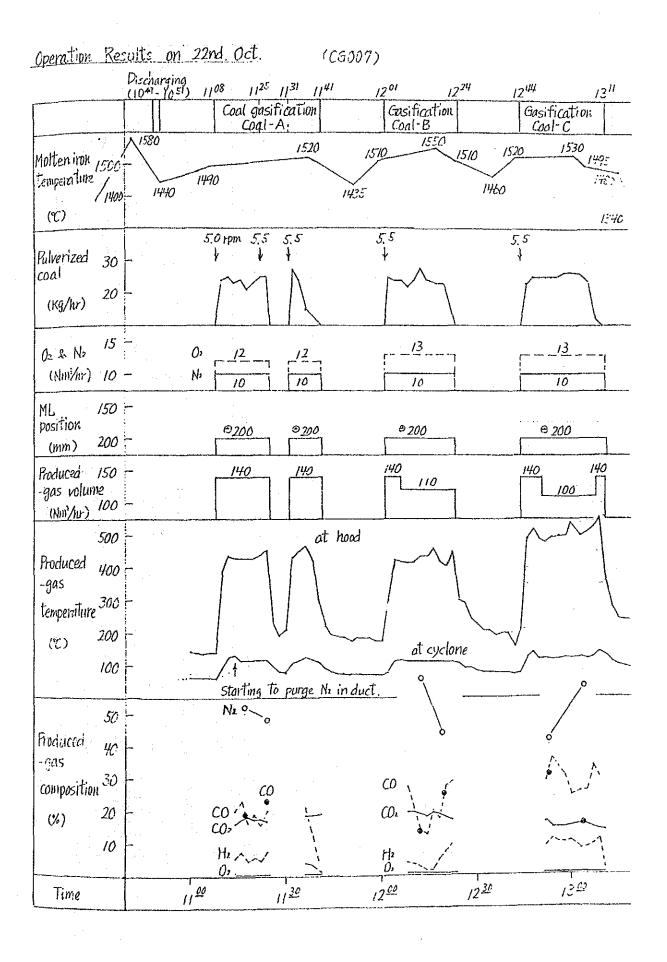
2. Test Results



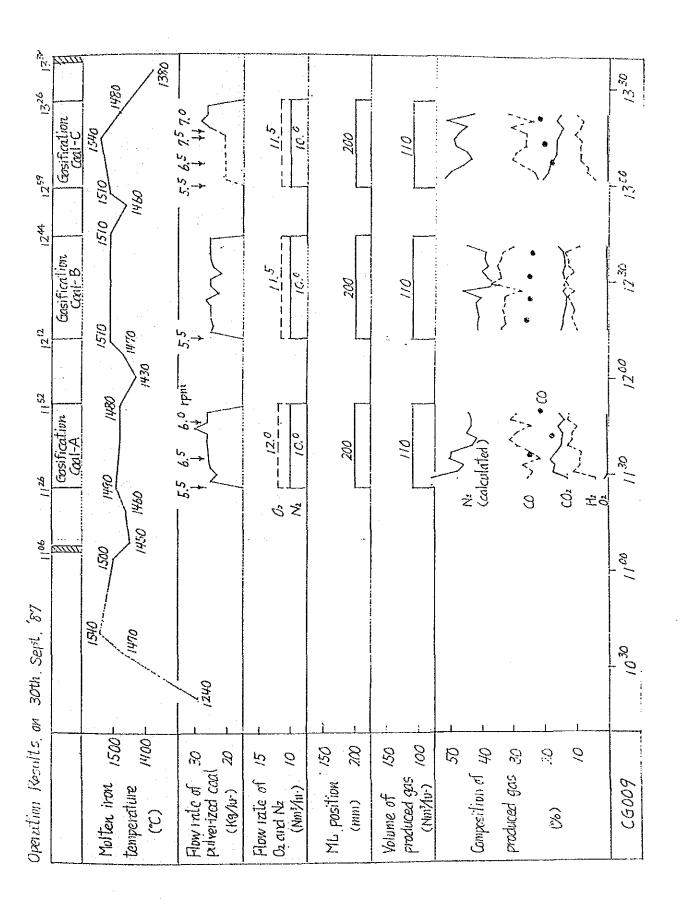


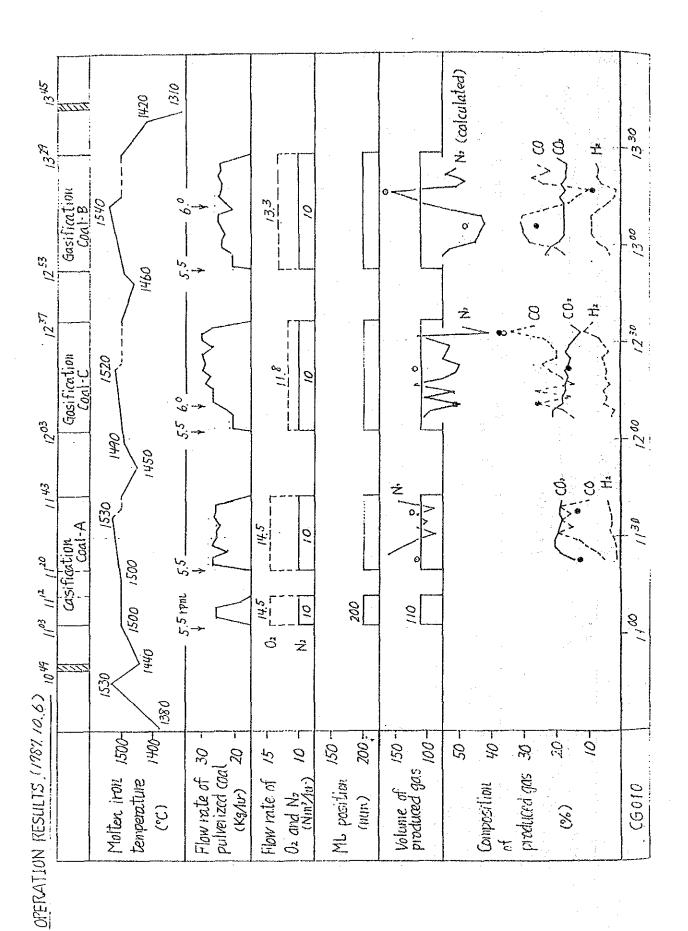


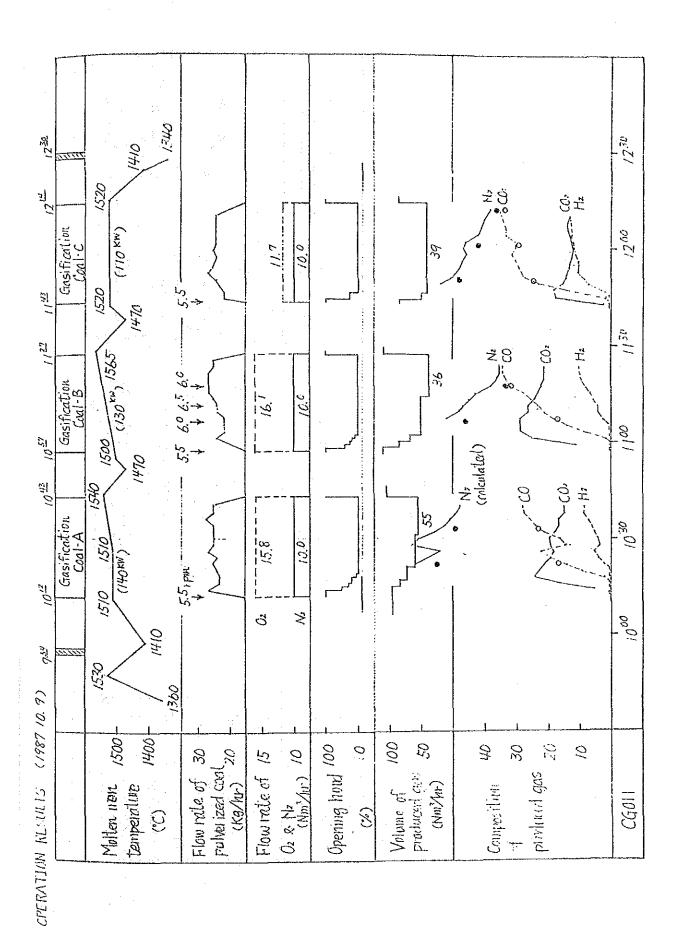


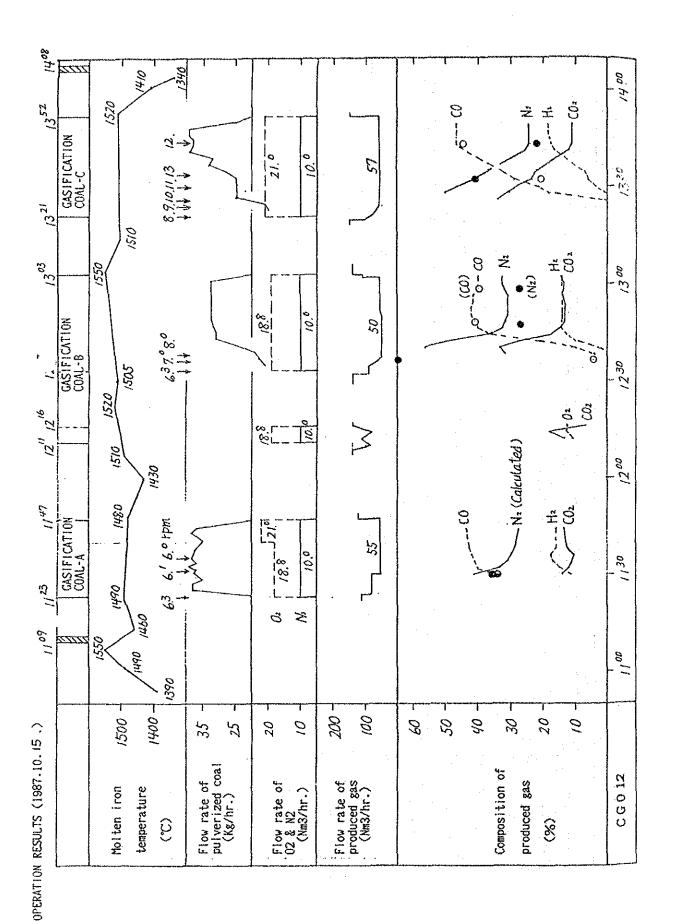


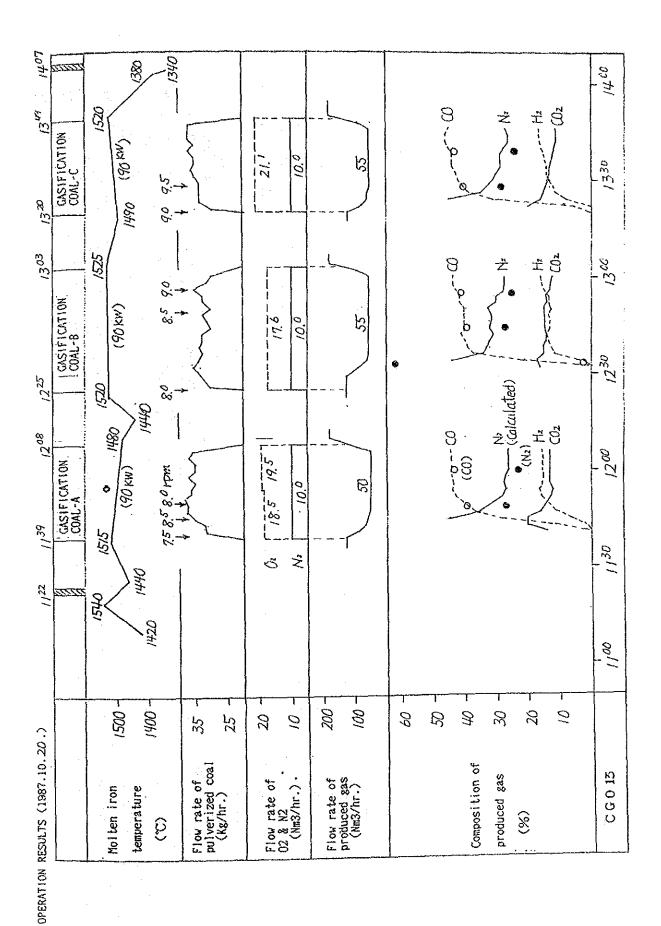
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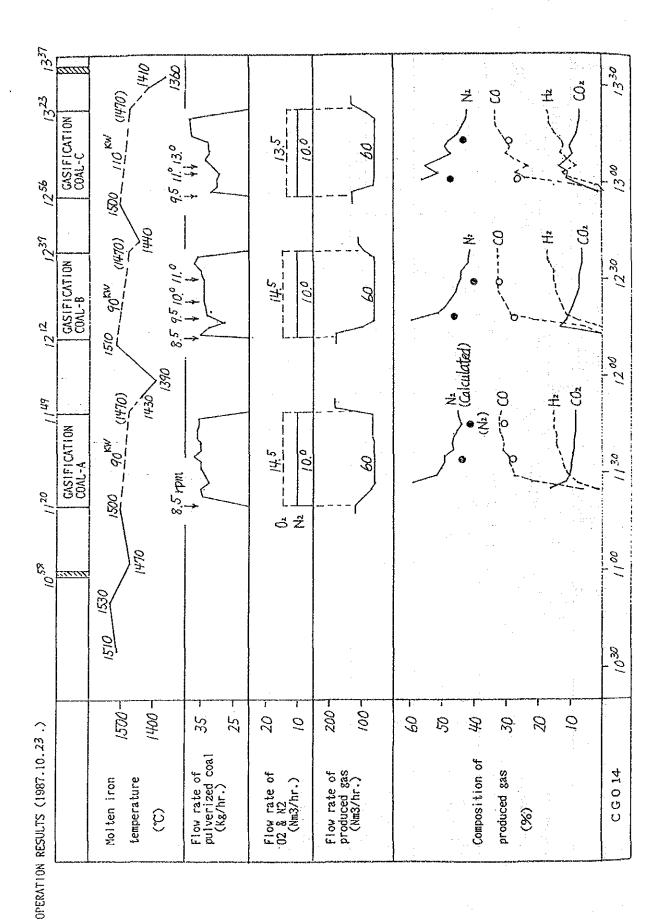




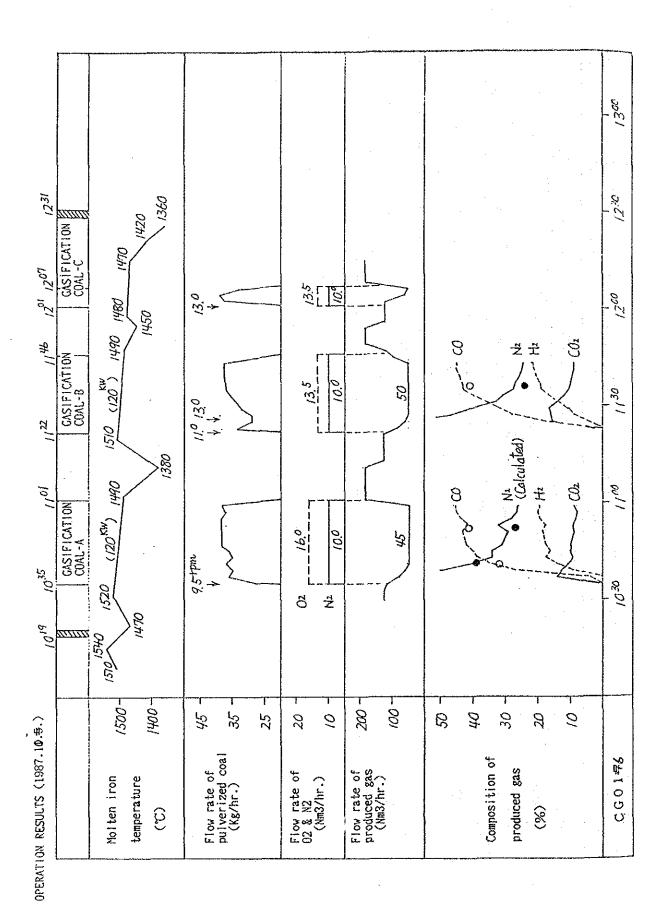


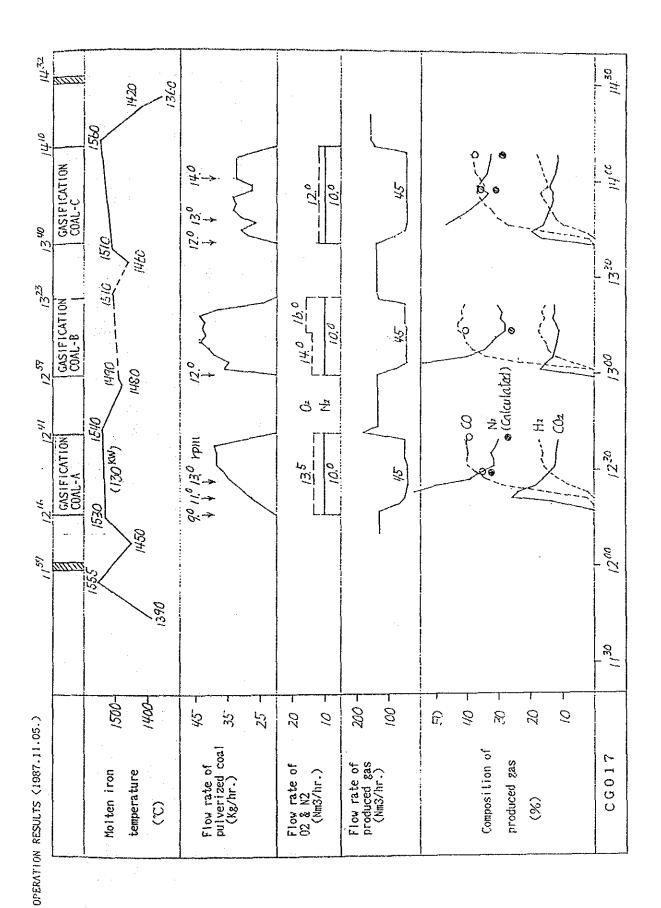


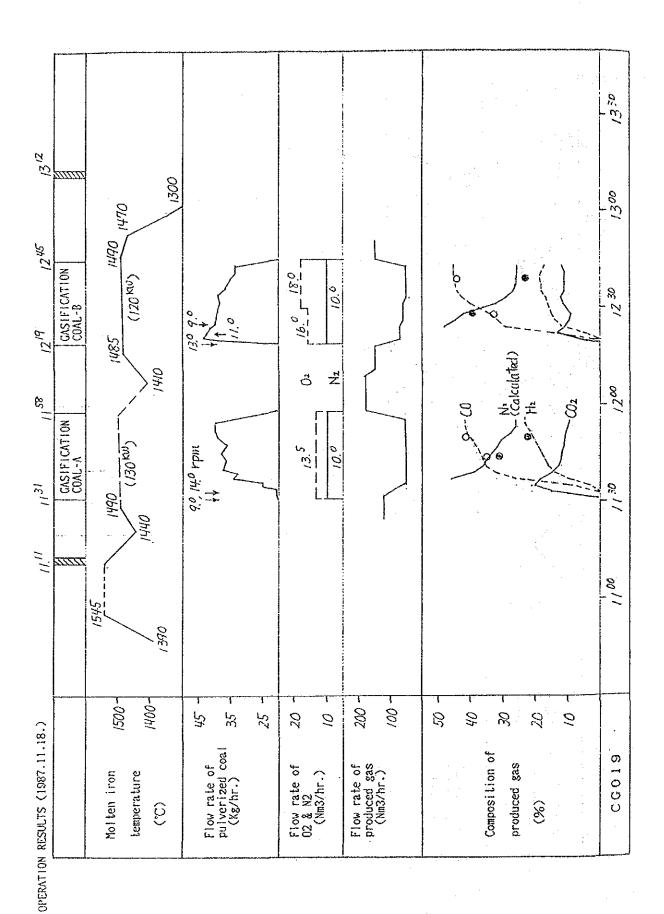


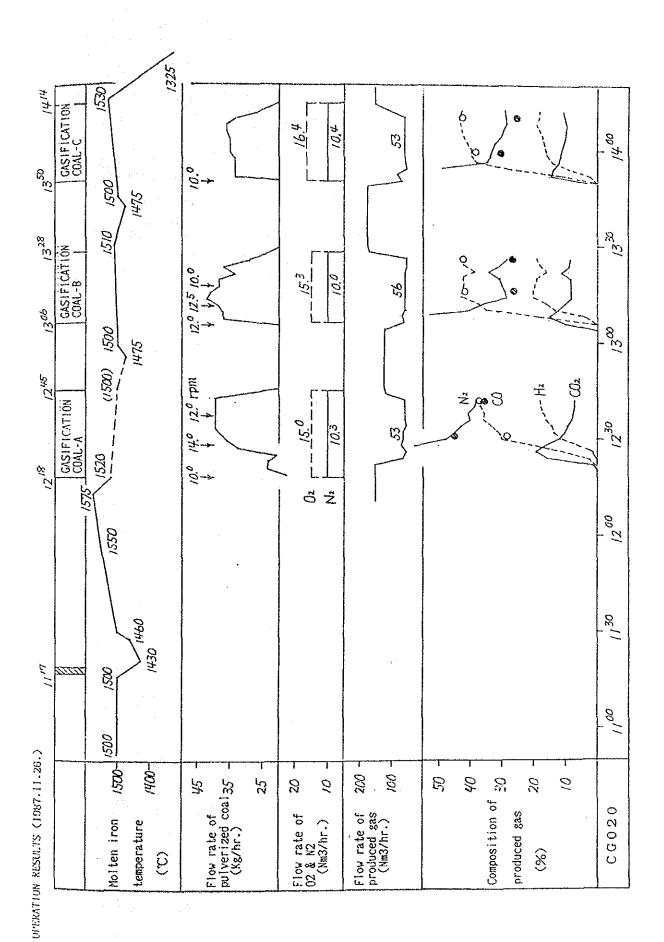


10'28 1049 1/16 1/32 1200 12'7 12 45 GASIFICATION GASIFICATION GASIFICATION GOAL-C COAL-A COAL-B	1500 (120 km) 1500 (120 km) 1510 (120 km) 1490 1450 (120 km) 1490 1460 1450 145 45 145 45 45 145 45 45 45 45 45 45 45 45 45 45 45 45 4		02	277	N; (Calculated) V, H; H; H; CO, CO	1030 1100 1130 1250 1350
OPERATION RESULTS (1987.10.27.)	Molten iron 1500- 1540 temperature 1400-	Flow rate of 35 - (Kg/hr.) 25 - 25 -	Flow rate of 20 = 02 8 N2 (Nm3/hr.) 10 =	Flow rate of 200 - produced gas (Nm3/hr.) 100 -	60 - 50 - 50 - 50 - 50 - 50 - 50 - 50 -	CG015



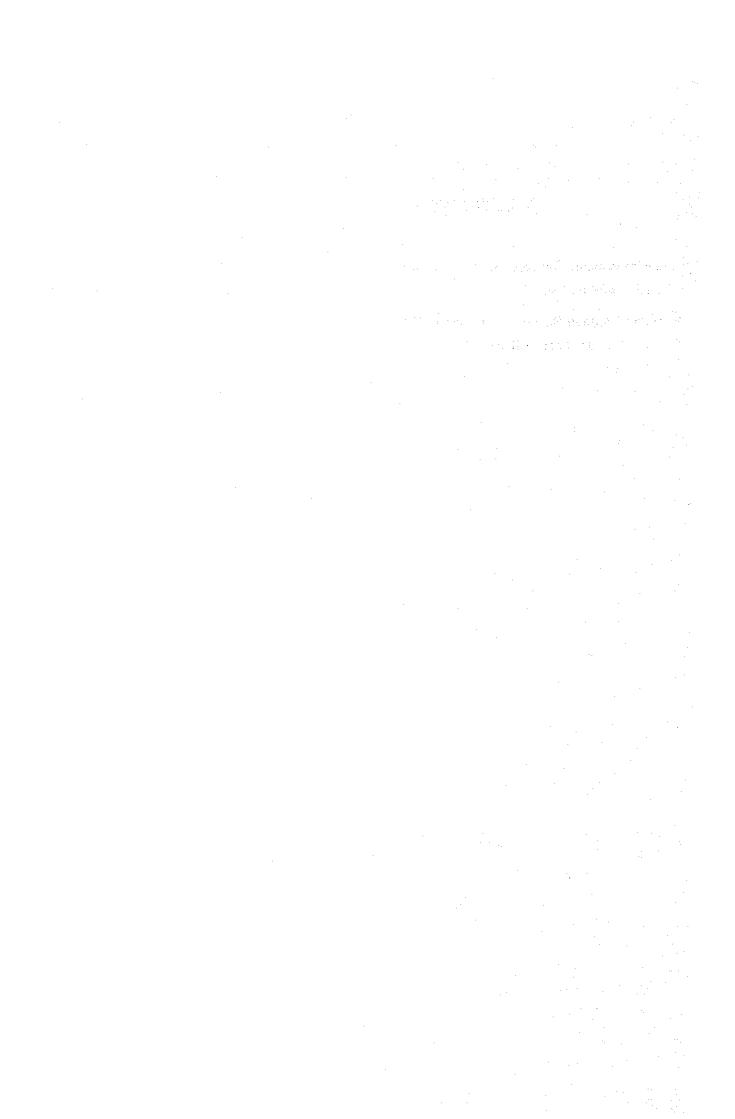






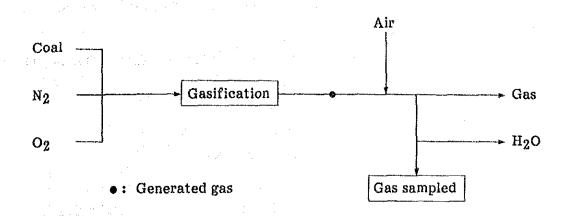
ATTACHMENT 8-4

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1.	Material Balance Based on Gas Sampled from	179
	Inside of Gasifier	
2.	Material Balance Based on Gas Sampled from	183
	Position just before IDF	



en en la companya de la contrata de la formación de la companya de la companya de la companya de la companya d		
가게 되자 생각을 내용하고 있습니다. 그는 어린 네트리스 이번 때문에 되었다.		
그 이 병사를 잘 했다면 가족이지 못 하셨습니다. 그는 그는 그는 그는 그는 그는 그는 그는 그를 다 되었다면 하다고 있다면 그는 그는 그는 그는 그는 그는 그는 그는 그는 그를 다 되었다면 하는 그는 그는 그는 그는 그를 다 되었다면 하는 것이다.	.*	
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1. Material Balance Based on Gas Sampled from Inside of Gasifier		
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1. Material Flow



As shown in material flow, coal, N_2 and O_2 become generated gas by gasification. We want to know an information of generated gas, however air from the atmosphere mixes and reacts with generated gas before we get gas sample. Furthermore we analyzed gas component as dry.

Therefore we should estimate real gas component by material balance calculation.

2. Assumption

- Oxygen in the air from the atmosphere reacts with CO and $\rm H_2$ in the generated gas, generating $\rm CO_2$ and $\rm H_2O$.
- If summation of each content of gas components such as CO, CO₂, H_2 , H_2O , N_2 and so on would not be 100%, N_2 content would be modified to make the summation 100%.

3. Calculation Method

By making material balance for H_2 , O_2 and N_2 around gasifier we can know the following unknown values.

Unknown values:

- 1) gas components in generated gas (CO, CO₂, H₂, O₂, N₂, H₂O, H₂S, COS)
- 2) amount of generated gas
- 3) amount of air from the atmosphere
- 4) H2O content in sampled gas

Known values:

- 1) property of coal (ash, moisture, C, H, O, N, S)
- operation conditions (coal feed rate, carrier gas flow rate, oxygen flow rate)
- gas components in sampled gas (CO, CO₂, H₂, O₂, N₂, H₂S, COS)
- (1) Hydrogen balance

$$HSUI = \frac{22.4}{18} \times CFR \times Moi/100$$

HGEN =
$$\frac{22.4}{2}$$
 ×CFR×(100 - Ash - Moi)/100×H/100

$$HGAS = (Y + 0.79Z - X) \times (H_2GS + H_2SGS)/100$$

$$HJO = X$$

(2) Nitrogen balance

$$NGEN + 0.79Z + CGFR = NGAS$$

$$NGEN = \frac{22.4}{28} \times CFR \times (100 - Ash - Moi)/100 \times N/100$$

$$NGAS = (Y + 0.79Z - X) \times N2GSD/100$$

(3) Oxygen balance

$$OSUI + OGEN + OFR + 0.21Z = OGAS + OJO$$

$$OSUI = \frac{11.2}{18} \times CFR \times Moi/100$$

OGEN =
$$\frac{22.4}{32}$$
 × CFR×(100 - Ash - Moi)/100×O/100

$$OGAS = (Y + 0.79Z - X) \times (COGS/2 + CO2GS + O2GS + COSGS/2)/100$$

(4) Gas compositions in generated gas

CO: $Y \times CO/100 - 0.21Z \times neo \times 2 = (Y + 0.79Z - X) \times COGS/100$ CO2: $Y \times CO_2/100 + 0.21Z \times neo \times 2 = (Y + 0.79Z - X) \times CO_2GS/100$ H₂: $Y \times H_2/100 - 0.21Z \times (1 - neo) \times 2 = (Y + 0.79Z - X) \times H_2GS/100$ O2: $Y \times O_2/100$ = $(Y + 0.79Z - X) \times O_2GS/100$ N₂: $Y \times N_2/100 + 0.79Z$ = $(Y + 0.79Z - X) \times N_2GS/100$ H₂S: $Y \times H_2S/100$ = $(Y + 0.79Z - X) \times H_2SGS/100$ COS: $Y \times COS/100$ = $(Y + 0.79Z - X) \times COSGS/100$ H₂O: $Y \times H_2O/100 + 0.21Z \times (1 - neo) \times 2 = X$

Assumption: nco is given under the following assumption

$$K = \frac{\text{CO} \times \text{H}_2\text{O}}{\text{CO}_2 \times \text{H}_2} = \frac{\text{COGS} \times \text{X}}{\text{CO}_2\text{GS} \times (\text{Y} + 0.79\text{Z} - \text{X}) \times \text{H}_2\text{GS}/100}}$$

X, Y and Z can be calculated by three simultaneous equations of (1), (2) and (3).

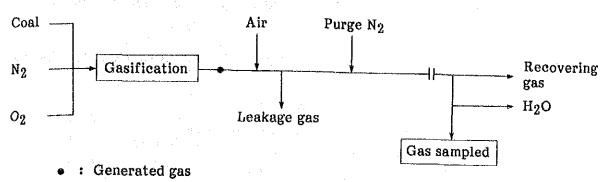
Therefore gas composition in generated gas can be also calculated by the upper equation (4).

Ash	Ash in coal (%)
Moi	Moisture in coal (%)
C	Carbon in coal (%) (d.a.f.)
Н	Hydrogen in coal (%) (d.a.f.)
O	Oxygen in coal (%) (d.a.f.)
N	Nitrogen in coal (%) (d.a.f.)
S	Sulfur in coal (%) (d.a.f.)
CFR	Coal feed rate (kg/h)
CGFR	Carrier gas flow rate (Nm ³ /h)
OFR	Oxygen flow rate (Nm ³ /h)
COGS	CO content in sampled gas (%)
CO ₂ GS	CO ₂ content in sampled gas (%)
H ₂ GS	H ₂ content in sampled gas (%)
O ₂ GS	O2 content in sampled gas (%)
N ₂ GS	N2 content in sampled gas (%)
H ₂ SGS	H2S content in sampled gas (%)
COSGS	COS content in sampled gas (%)

CO	CO content in generated gas (%)
CO_2	CO ₂ content in generated gas (%)
H ₂	H ₂ content in generated gas (%)
o_2	O ₂ content in generated gas (%)
N_2	N ₂ content in generated gas (%)
H_2S	H ₂ S content in generated gas (%)
COS	COS content in generated gas (%)
H ₂ O	H ₂ O content in generated gas (%)
Y	Amount of generated gas (Nm ³ /h)
Z	Amount of air (Nm ³ /h)
X	Amount of H_2O in sampled gas (Nm $^3/h$)
AA	Summation of gas components in sampled gas (%)
N ₂ GSD	N ₂ content in sampled gas after modification
	$(N_2GSD = N_2GS + 100 - AA)$
Y_2	Amount of leakage gas (Nm ³ /h)
N_2P	Amount of purge N ₂ (Nm ³ /h)
HSUI	Hydrogen amount in moisture in coal (Nm ³ /h)
HGEN	Hydrogen amount in coal (Nm ³ /h)
HGAS	Hydrogen amount in sampled gas (Nm ³ /h)
HJO	Hydrogen amount in H_2O in sampled gas (Nm 3 /h)
NGEN	Nitrogen amount in coal (Nm ³ /h)
NGAS	Nitrogen amount in sampled gas (Nm ³ /h)
osui	Oxygen amount in moisture in coal (Nm ³ /h)
OGEN	Oxygen amount in coal (Nm ³ /h)
OGAS	Oxygen amount in sampled gas (Nm ³ /h)
OJO	Oxygen amount in H ₂ O in sampled gas (Nm ³ /h)
ηθο	Utilization ratio of oxygen in air to burn CO
FI	Recovering gas flow rate (m ³ /h)
ρΟ	Design value of density of recovering gas (kg/m^3)
ρ	Actual density of recovering gas (kg/m³)
То	Design value of temperature of recovering gas (°C)
T	Actual temperature of recovering gas (°C)
PPI	Pressure difference in bag filter (mmH ₂ O)
Po	Design value of pressure of recovering gas (mmH2O)

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	ti. Kalendari				
2. Material Balance Based on Gas Sam	pled from	Position	just before	e IDF	
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1. Material Flow



|| : Gas flow meter

As shown in material flow, coal, N_2 and O_2 become generated gas by gasification. After that, air from the atmosphere mixes and reacts with generated gas and then a part of gas leaks from the space between hood and gasifier. Furthermore purge N_2 comes in from main lance hole and bag filter. After taking these change, gas passes through gas flow meter and is sampled at the position just before IDF in gas recovering duct.

In this material flow, we would know about an information of real generated gas.

2. Assumption

- (1) Oxygen in the air from the atmosphere reacts with CO and H_2 in the generated gas, generating CO_2 and H_2O .
- (2) If summation of each content of gas components such as CO, CO_2 , H_2 , H_2O , N_2 and so on would not be 100%, N_2 content would be modified to make the summation 100%.

3. Calculation Method

By making material balance for H_2 , O_2 and N_2 around gasifier we can know the following unknown values.

Unknown values:

- 1) gas components in generated gas (CO, CO₂, H₂, O₂, N₂, H₂O, H₂S, COS)
- 2) amount of generated gas
- 3) amount of air from the atmosphere
- 4) amount of leakage gas
- 5) H₂O content in sampled gas

Known values:

- 1) property of coal (ash, moisture, C, H, O, N, S)
- operation conditions (coal feed rate, carrier gas flow rate, oxygen flow rate, recovering gas flow rate)
- 3) gas components in sampled gas (CO, CO₂, H₂, O₂, N₂, H₂S, COS)

Y+0.79Z-Y ₂ +N ₂ P COII	
COII	
	COGS
CO_2II	CO ₂ GS
H_2II	H ₂ GS
H ₂ OII	/
O_2II	O ₂ GS
N_2II	N ₂ GS
H ₂ SII	H ₂ SGS
COSII	COSGS
· 1	
Purge N ₂ N ₂ P Nm ³ /h	
	CO ₂ II H ₂ II H ₂ OII O ₂ II N ₂ II H ₂ SII COSII

(1) Hydrogen balance

$$HSUI + HGEN = Y \times (H_2 + H_2O + H_2S)/100$$

$$= (Y + 0.79Z) \times (H_2I + H_2OI + H_2SI)/100$$

$$= Y_2 \times (H_2I + H_2OI + H_2SI)/100$$

$$+ (Y + 0.79Z - Y_2 + N_2P) \times (H_2II + H_2OII + H_2SII)/100$$

$$H_2 : Y \times H_2/100 - Z \times 0.21 \times 2 \times (1 - \eta co) = (Y + 0.79Z) \times H_2GS \times A \times B/100$$

$$H_2O : Y \times H_2O/100 + Z \times 0.21 \times 2 \times (1 - \eta co) = (Y + 0.79Z) \times H_2OII \times B/100$$

$$H_2S : Y \times H_2S/100 = (Y + 0.79Z) \times H_2SGS \times A \times B/100$$

$$Y \times (H_2 + H_2O + H_2S)/100 = (Y + 0.79Z) \times B \times (H_2OII + A \times (H_2GS + H_2SGS))/100$$

$$\dots (1)$$

Y + 0.79Z - Y₂ + N₂P = FI×D
D = SQRT
$$\left(\frac{\rho O}{\rho}\right) \times \left(\frac{\text{To}+273}{\text{T}+273}\right) \times \left(\frac{10^4-\text{PDI}}{\text{Po}}\right)$$

A = (100 - H₂OII)/100
B = (Y + 0.79Z - Y₂ + N₂P)/(Y + 0.79Z - Y₂)

(2) Oxygen balance

OSUI + OGEN + OFR =
$$Y \times (CO/2 + CO_2 + H_2O/2 + O_2 + COS/2)/100$$

OSUI + OGEN + OFR + 0.21Z = $(Y + 0.79Z) \times (COI/2 + CO_2I + H_2OI/2 + O_2I + COSI/2)$
= $Y_2 \times (COI/2 + CO_2I + H_2OI/2 + O_2I + COSI/2)$,
+ $(Y + 0.79Z - Y_2 + N_2P) \times (COII/2 + CO_2II + H_2OII/2 + O_2II + COSII/2)/100$

CO: COI = COGS×A×B

CO₂: CO₂I = CO₂GS×A×B

H₂O: H₂OI = H₂OII×B

O₂: O₂I = O₂GS×A×B

COS: COSI = COSGS×A×B

× OSUI + OGEN + OFR + 0.21Z =
$$(Y + 0.79Z)$$
×B×(A×(COS/2 + CO₂GS + O₂GS + COSGS/2) + H₂OII/2)/100

..... (2)

(3) Nitrogen balance

NGEN + CGFR =
$$Y \times N_2/100$$

NGEN + CGFR + 0.79Z = $(Y + 0.79Z) \times N_2I/100$
NGEN + CGFR + 0.79Z - $Y_2 \times N_2I/100 + N_2P = (Y + 0.79Z - Y_2 + N_2P)$
 $\times N_2II/100$
 $(Y + 0.79Z - Y_2) \times N_2I/100 = (Y + 0.79Z - Y_2 + N_2P) \times N_2II/100 - N_2P$
 $N_2II = N_2GS \times A$
NGEN + CGFR + 0.79Z = $(Y + 0.79Z) \times B \times (A \times N_2GS/100 - N_2P/(Y + 0.79Z - Y_2 + N_2P))$
...... (3)

From equation (1) and (2), Y and Z can be calculated, if H_2OII could be assumed a certain value.

After that we check whether both sides in equation (3) are equal or not, if they are OK, we can have all components in generated gas.

Ash	Ash in coal (%)
Moi	Moisture in coal (%)
C	Carbon in coal (%) (d.a.f.)
H	Hydrogen in coal (%) (d.a.f.)
0	Oxygen in coal (%) (d.a.f.)
N	Nitrogen in coal (%) (d.a.f.)
S	Sulfur in coal (%) (d.a.f.)
CFR	Coal feed rate (kg/h)
CGFR	Carrier gas flow rate (Nm ³ /h)
OFR	Oxygen flow rate (Nm ³ /h)
COGS	CO content in sampled gaas (%)
CO ₂ GS	CO ₂ content in sampled gas (%)
H ₂ GS	H ₂ content in sampled gas (%)
O_2GS	O_2 content in sampled gas (%)
N ₂ GS	N ₂ content in sampled gas (%)
H ₂ SGS	H ₂ S content in sampled gas (%)
COSGS	COS content in sampled gas (%)
СО	CO content in generated gas (%

CO_2	CO ₂ content in generated gas (%)
H ₂	H ₂ content in generated gas (%)
O_2	O ₂ content in generated gas (%)
N ₂	N ₂ content in generated gas (%)
H ₂ S	H ₂ S content in generated gas (%)
COS	COS content in generated gas (%)
H ₂ O	H ₂ O content in generated gas (%)
Y	Amount of generated gas (Nm ³ /h)
Z	Amount of air (Nm ³ /h)
X	Amount of H ₂ O in sampled gas (Nm ³ /h)
AA	Summation of gas components in sampled gas (%)
N ₂ GSD	N ₂ content in sampled gas after modification
	$(N_2GSD = N_2GS + 100 - AA)$
Y ₂	Amount of leakage gas (Nm ³ /h)
N_2P	Amount of purge N_2 (Nm ³ /h)
HSUI	Hydrogen amount in moisture in coal (Nm ³ /h)
HGEN	Hydrogen amount in coal (Nm ³ /h)
HGAS	Hydrogen amount in sampled gas (Nm ³ /h)
НЈО	Hydrogen amount in H ₂ O in sampled gas (Nm ³ /h)
NGEN	Nitrogen amount in coal (Nm ³ /h)
NGAS	Nitrogen amount in sampled gas (Nm ³ /h)
OSUI	Oxygen amount in moisture in coal (Nm ³ /h)
OGEN	Oxygen amount in coal (Nm ³ /h)
OGAS	Oxygen amount in sampled gas (Nm ³ /h)
Olo	Oxygen amount in H ₂ O in sampled gas (Nm ³ /h)
η c ο	Utilization ratio of oxygen in air to burn CO
FI	Recovering gas flow rate (Nm ³ /h)
ρO	Design value of density of recovering gas (kg/m ³)
ρ	Actual density of recovering gas (kg/m ³)
To	Design value of temperature of recovering gas (°C)
T	Actual temperature of recovering gas (^o C)
PPI	Pressure difference in bag filter (mmH ₂ O)
Po	Design value of pressure of recovering gas (mmH2O)

ATTACHMENT 11-3

- Electricity Generation Cost by Coal Firing
 Power Plant with Fluidized-bed Boiler
- Computer Printout (Electricity Generation Cost,
 Case E-9)



1. Electricity Generation Cost by Coal Firing Power Plant with Fluidized-bed Boiler

Electricity Generation Cost by Coal Firing Power Plant with Fluidized-bed Boiler

1. Objective of the Study

This study has been carried out for the purpose of preliminary evaluation of economic feasibility on the case of electricity generation from Banko coal by using the fluidized-bed boiler in order to compare with the economic evaluation of coal gasification combined-cycle (CGCC) power generation studied in FY1986.

As a matter of convenience between this plant and CGCC power plant in FY1986, the same gross generating capacity (900 MW) was selected in this study.

Assumption of economic factors such as electricity generation schedule, finance, sales price and raw material cost is same as those in the study in FY1986.

2. Outline of Power Plant

2-1 Design Basis

(1) Type of Power Plant : Thermal Power Plant with Fluidized-bed

Boiler

(2) Generating Power

Gross Generating Power : 900 MW

Net Generating Power : 818 MW

(For Home Consumption: 82 MW)

(3) Annual Operation Days : 320 days/year

(4) Plant Location : Tanjung Priok

(5) Electricity Transmission : Switchyard of Power Plant

(Note): Electricity will be sold to PLN.

(6) Feed Coal Specification:

C, % : 27.4

V.M., % : 32.8

Ash, % : 4.8

Mo., % : 35.0

Total, % : 100.0

HV, Kcal/kg : 4,430

(7) Coal Receiving

Bunker Hopper at Mine Site

(8) Utilities

All the utilities except raw water and coal are generated inside the plant. Drying of coal is carried out by utilizing the heat of boiler flue gas. Cooling water for main condenser is supplied at 30°C and returned at 37°C.

2-2 Plant Configuration

Fig. 1 shows the scope of power plant devided into five blockes each of which has its individual function.

The component facilities in each block are listed in Table 1. The main processes and systems are described in the following pages.

2-3 Belt Conveyor System

See the Interim Report II (FY 1985), page 192-197.

2-4 Electricity Generation

(1) Process Flow Diagram

See Fig. 2.

(2) Process Description (Fig. 2 & Fig. 3)

- 1) The plant comprises three trains. Each train consists of 300 MW single reheat steam turbine generator set and 3 units of fluidized bed boiler.
- 2) The fluidized bed boiler is especially suitable for burning the difficult-burn coal such as lignite with water high content and anthracite.
- 3) The feedwater is heated by 3 units of LP feedwater heaters, deaerator, and 4 units of HP feedwater heaters. The steam for heating of each feedwater is extracted from the respective steam turbine bleeding point.

(3) Major Equipment

Specifications and the number of units of major equipment are listed in Table 2.

2-5 Utility Requirement

See Table 3 and Fig. 4.

Table 3 Utility Requirement

Coal	478 T/h (external supply)
Raw Water	1,680 T/h (ditto)
Electricity	818,000 kW (outside supply)
ditto	82,000 kW (internal supply)
Cooling Water	155,000 T/h (ditto)
CaCOa	15 T/h

2-6 Plant Layout

The detailed layout cannot be determined in this stage but the image of it is roughly estimated as shown in Fig. 5.

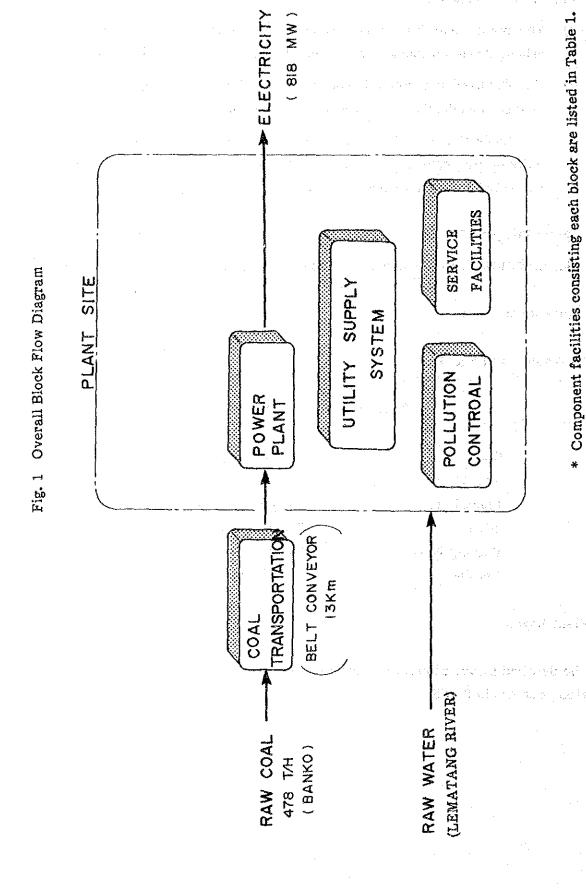


Table 1 Plant Configuration

1) Belt Conveyor System

Primary Crusher/Feeder Overland Coal Conveyor

2) Coal and Limestone Handling

Coal Storage and Handling Coal Pretreatment Limestone Storage and Handling

3) Power Plant & Utility System

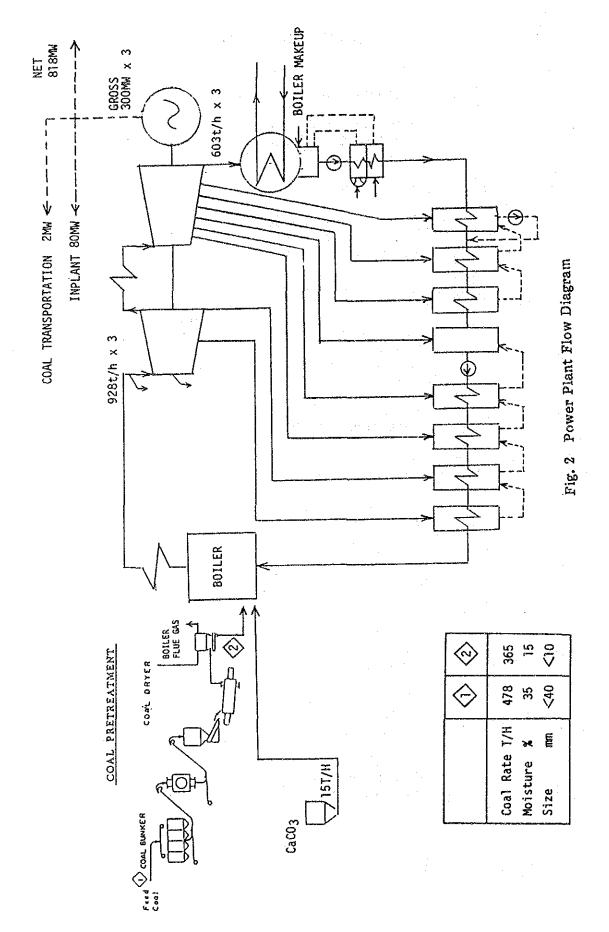
Gas Turbine/Generator
Steam Turbine/Generator
Coal Fired Fluidized Bed Boiler
Power Distribution
Water Cooling
Raw Water Intake/Pretreatment
Instrument/Plant Air Supply

4) Pollution Control/Safety System

Waste Water Treatment Solid Waste Disposal Flare/Blowdown Fire Fighting

5) Service Facilities

Administration Office Laboratory Warehouse Accommodation Canteen Cafeteria Leisure Center Mosque Communication System Maintenance Shop Portable Water Supply



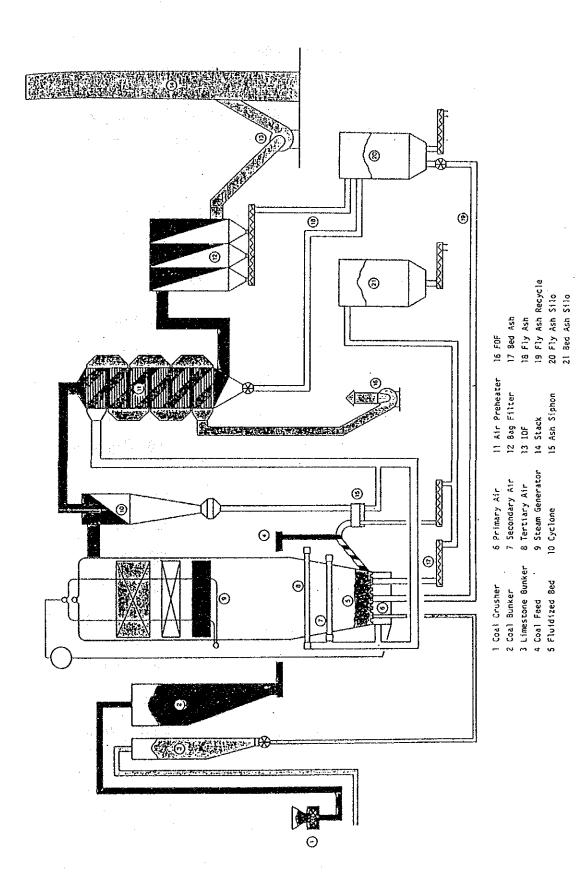
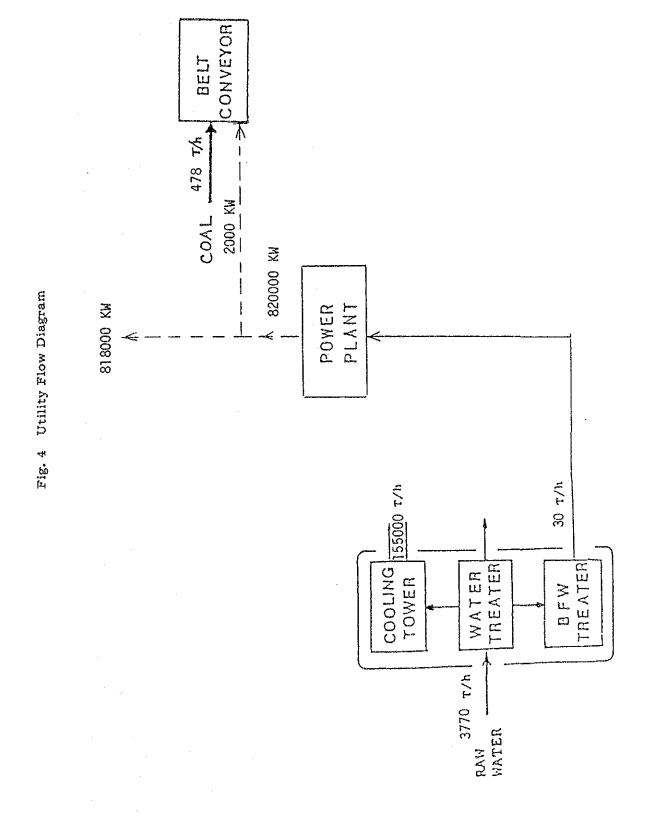


Fig. 3 Scheme of Fluidized Bed Boiler

Table 2 Major Equipment

	Description	Q'ty	Capacity
١.	Coal Handling Section		
	1.1 Primary Crusher	3	200 t/h
	1.2 Dewatering Drum	3	160 t/h
2.	Thermal Power Plant Section		
	Fluidized bed boiler	9	310 t/h
	Steam turbine/generator unit	3	300 MW
	Steam condenser	3	603 t/h x 700 mmHgV
	Vacuum pump	3	700 mmHgV
	Condensate pump	9 (3 standby)	360 m ³ /h x 200 m
	Feedwater tank	3	10 m ³
	HP feedwater heaters	12	928 t/h
	Deaerators	3	928 t/h
	LP feedwater heaters	9	702 t/h
	Boiler feed pumps	9 (3 standby)	510 t/h x 198 at
	Cooling tower	4.1	155,000 t/h
	Demineralized water plant	3	35 t/h
	Raw water pump	2 (1 standby)	1,900 t/h x 30m



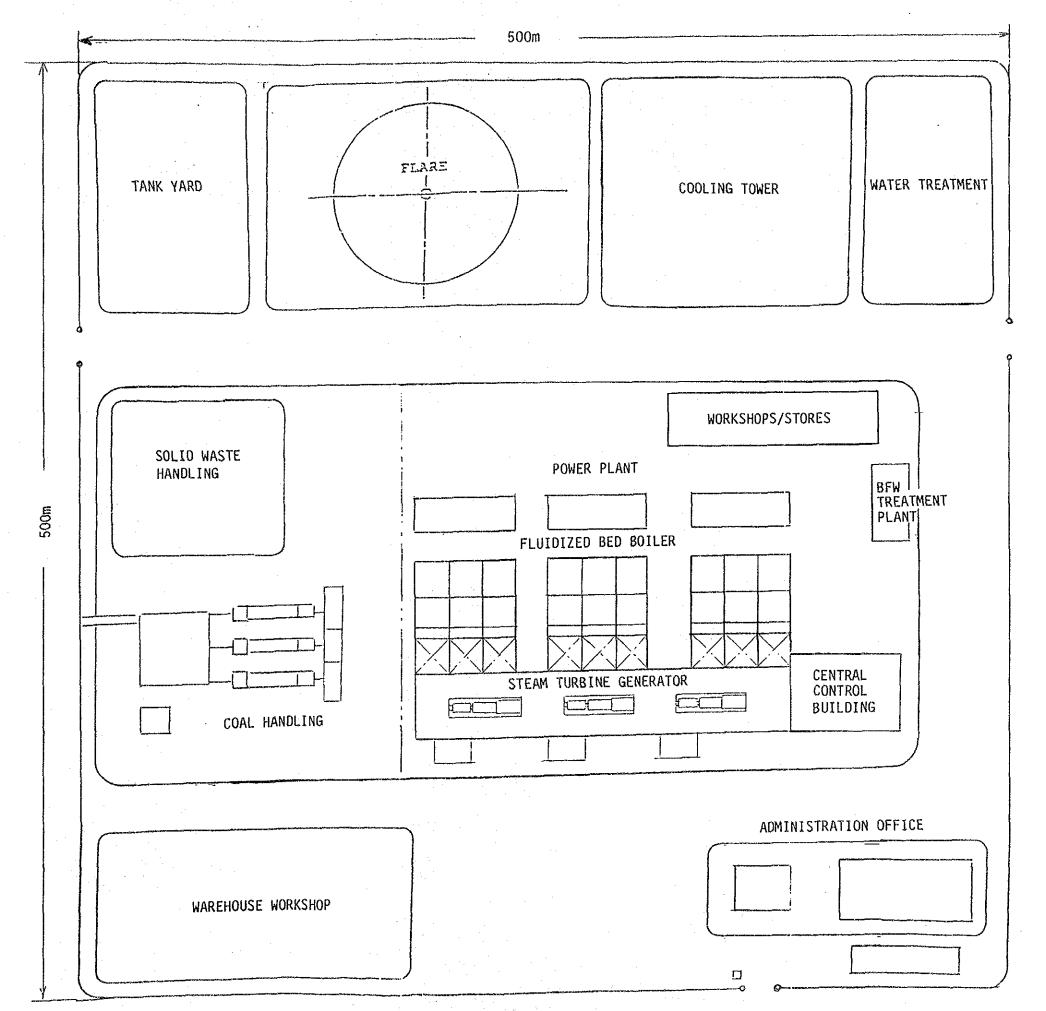


Fig. 5 Plant Layout

3. Financial Analysis

Financial viability and profitability of the project was evaluated by means of financial statements* and internal rate of return (hereafter referred to as IRR) on total project investment.

* Projected Profit & Loss Statement
Projected Cash Flow Statement
Projected Balance Sheet

3-1 Assumptions

(1) Electricity Generation Schedule

1) Net Generating Power : 818 MW

where

2) Average Load Factor : 66%(Note): Same as with the case of CGCC in FY1986.

3) Plant Construction Period: 1990 - 1993 (4 years)

30% Completion at the end of 1990 60% Completion at the end of 1991 80% Completion at the end of 1992

100% Completion at the end of 1993

4) Project Life : 1994 - 2023 (30 years)

where 70% of full operation in 1994 85% of full operation in 1995

100% of full operation in 1996 and after

5) Annual Operation Days : 320 days

(2) Finance

Same as that in the economic evaluation on methanol production (FY1985) and on CGCC power generation (FY1986).

(For details, see the Interim Report II (FY 1985), page 214-215.)

(3) Escalation

No escalation is assumed.

(4) Price and Costs

ii)

1) Ex-Power Plant Price of Electricity

Supply to Jakarta:

Case E-7 : 43 Rp/KWH (7.76 ¥/KWH)

Case E-8 : 53 Rp/KWH (9.57 ¥/KWH)

Supply to Adjacent Area:

Case E-9 : 64 Rp/KWH (11.55 ¥/KWH)

Case E-10: 78 Rp/KWH (14.08 \(\frac{1}{2} \)/KWH)

(Note): Price is same as that in the case of CGCC in FY 1986. For details, see the Interim Report III (FY 1986), page 161 - 166.

2) Capital Investment Costs

i) Fixed-capital Investment:

	10 ⁶ Rupiah	(10 ⁶ Yen)
Coal Transportation	39,900	(7,200)
Power Plant/Support Facilities	736,800	(133,000)
Equipment Transportation	74,200	(13,400)
Contingency	42,700	(7,700)
Total	893,600	(161,300)
Working capital:	33,820	(6,105)

(Note): Working capital is added as cash-inflow at the end of the project.

iii)	Start-up Expense:	4,160	(750)
-	· · · · · · · · · · · · · · · · · · ·	in a second of the second	· ·
iv)	Operator Training Cost:	2,070	(374)

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The investment schedule is shown in Table 4.

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Table 4 Investment Schedule

	1990	1991	1992	1993
Fixed Capital	30%	30%	20%	20%
Working Capital	-	**	-	100%
Start-up Expense		•	-	100%
Operator Training	-	. - .		100%

3) Annual Expense

i) Fixed Costs

a) Depreciation and Amortization 1)*

		Period	<u>Amount</u>						
		Year	10 ⁶ Rupia/Year	(10 ⁶ Yen/Year)					
	· Boiler, Power	15	49,269	(8,893)					
	Plant, Cooling								
	Tower, Buildings			•					
	· Others	10	29,086	(5,250)					
	b) Maintenance		20,388	(3,680)					
٠	c) Insurance		8,155	(1,472)					
ii)	Variable Costs								
	a) Raw Material (Coal)2)*		39,867	(7,196)					
	 b) Superviser & Operating Foreign Staff³)* 	Labor							
	· Local Labor		2,166	(391)					
	e) Chemicals		1,224	(221)					
iii)	Plant Overhead Costs		8,748	(1,579)					
iv)	Administration Expenses		4,377	(790)					

(Note): 1) Capital investment for the plant construction including expenses and interests during construction period is depreciated and a amortized based on straight line method.

- 2) In the strategic study in FY1984, mining cost was estimated at \$13.88/ton-coal. In this study \$14.85/ton-coal is assumed as raw material costs by adding 7% to the mining cost as overhead.
- Foreign staff decrease in number as the project proceeds.
 (See Table 5)

Table 5 Costs for Foreign Staffs

Op. Year	1st	2nd	3rd	4th	5th	6th-30th
Year	1994	1995	1996	1997	1998	1999-2023
% on 1st year	100	70	50	30	10	0
Cost, 10 ⁶ Rupiah/year	6,582	4,607	3,291	1,975	658	0
(Cost, 10 ⁶ Yen/year)	(1,188)	(832)	(594)	(356)	(119)	(0)

(5) Evaluation Criteria

- 1) Financial Statement
 - i) Profit and Loss Statement
 - ii) Cash Flow Statement
 - iii) Balance Sheet
- IRR on Total Project Cost before Tax
 (For details, see the Interim Report II (FY 1985), page 218 219.)

3-2 Results and Evaluation

(1) Results

Results are summerized in Table 6.

Profit and loss statement and cash flow statement of Case E-9 which correspond to those of Case E-4 studied in FY1986 are shown in Table 7 and Table 8.

Table 6 Results of Financial Analysis

Case	Supply	to Jakarta	Supply to Adjacent Area								
Ouse	E-7	E-8	E-9	E-10							
Ex-plant Price of Electricity	43 Rp/kwH (7.76 ¥/kwH)	53 Rp/kwH (9.57 ¥/kwH)	64 Rp/kwH (11.55 ¥/kwH)	78 Rp/kwH (14.08 ¥/kwH)							
IRR on total Investment	7.4 %	10.8 %	14.0 %	17.5 %							
First Year to Have Profit before Tax (Year from Operation Starts)	11th	4th	2nd	1st							
Clean off of Accumu- lated Loss (Year from Operation Starts)	24th	9th	3rd	1st							
Pay off of All the Debts (Year from Loan Raised)	23th	14th	12th	12th							
Minimum Sales Price (IRR = Interest Rate)	44.7 Rp/kwH (8.08 ¥/kwH)										

Table 7 Profit and Loss Statement of Case E-9

Profit Boteling	Before (Tax) Net Earning Tax	(Tax) Profit	.8 -33.8 -33.	7.0 7.0 -26.	91 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2000	. C. S. S. S. C.	6.50 5.50 6.50	1.1 37.3 43.8 127.	0.1 41.4 48.6 175.	.1 45.1 53.	02.1 47.0 55.1 284.	02.1 47.0 55.	31.1 60.3 70.8	31.1 60.3 70.8 480.	31.1 60.3 70.8 551.	31.1 60.3 70.8 622.	31.1 60.3 70.8	80.4 83.0 97.4 790.	80.4 83.0 97.4	80.4 83.0 97.4 985.	80.4 83.0 97.4 1,08	80.4 83.0 97.4 1,180.	80.4 83.0 97.4 1,277.	0.4 83.0 97.4 1,375.	80.4 83.0 97.4 1,472.	80.4 83.0 97.4 1,570.	80.4 83.0 97.4 1,667.	80.4 83.0 97.4 1,	0.4 83.0 97.4 1,862.	0.4 83.0 97.4 1,959.	0.4 83.0 97.4 2,057.	
	Total Be		о П	α	916	• • •	:	ታ : ው	\$ 4 .	75.	Θ	63.	3	34.2	34.2	34.2	34.2	34	0	ۍ ص	۵.	₽	6.5	о О	6.	6	9.9	9.	ص ص	9	<#	84.9	
	Interest Paid	Interest Paid	Ω,	é	, 00	•	D 10	; ;	å	<₹	•	0	0	0	0	0	0	0	0	o	0	0	C	0	9	0	0	0	6	0	0	0	
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Table 8 Cash Flow Statement of Case E-9

(Unit: 109 Rupiah)

						(Unit:	10 ⁹ Rupiah)		
Year	OP Year	Investment	Profit Before Tax	Depreciation/ Amortization	Interest Paid	Cash Flow	DCF (Base; 1985)		
1990		-268.1				-268.1	-139.4		
1991		-268.1	-			-268.1	-122.3		
1992		-178.7	-	-	_	-178.7	-71.5		
1993		-218.8	-	_		-218.8	-76.8		
1994	1	-	-33.8	78.4	62.0	106.6	32.8		
1995	2	· -	7.0	78.4	56.8	142.2	38.4		
1996	3		50.0	78.4	48.7	177.1	42.0		
1997	4	_	60.5	78.4	39.6	178.4	37.1		
1998	5	gal sites 🕳 .	70.9	78.4	30.5	179.8	32.8		
1999	6		81.1	78.4	20.9	180.4	28.9		
2000	7	ma	90.1	78.4	12.0	180.4	25.3		
2001	8	site of suite	98.1	78.4	4.0	180.4	22.2		
2002	9		102.1	78.4	0	180.4	19.5		
2003	10	-	102.1	78.4	0	180.4	17.1		
2004	11	_	131.1	49.3	. 0	180.4	15.0		
2005	12	-	131.1	49.3	0	180.4	13.2		
2006	13	-	131.1	49.3	0	180.4	11.6		
2007	14	-	131.1	49.3	0	180.4	10.1		
2008	15	-	131.1	49.3	0	180.4	8.9		
2009	16	-	180.4	· ()	0	180.4	7.8		
2010	17		180.4	0	0	180.4	6.8		
2011	18	i kan ya ki n a	180.4	0	- 0	180.4	6.0		
2012	19	-	180.4	0	0	180.4	5.3		
2013	20	-	180.4	. 0	0	180.4	4.6		
2014	21	-	180.4	. 0	0	180.4	4.1		
2015	22	-	180.4	0	0	180.4	3.6		
2016	23	-	180.4	0	0	180.4	3.1		
2017	24	-	180.4	0	0	180.4	2.7		
2018	25	-	180.4	0	Q	180.4	2.4		
2019	26		180.4	0	0	180.4	2.1		
2020	27	,	180.4	0	. 0	180.4	1.9		
2021	28	-	180.4	0	0	180.4	1.6		
2022	29	- ·	180.4	0	0	180.4	1.4		
2023	30	***	180.4	0	0	214.2	1.5		
	Total	-933.7	3,990.1	1,029.9	274.6	4,394,7	0		
-	1	<u> </u>		<u> </u>	L	<u> </u>	L		

(2) Evaluation

- 1) As far as IRR is concerned, the resulting 14.0% of IRR on Case E-9 is a little better than that of the Base Case of methanol production (13.2%) in FY 1985. When the electricity is distributed to the Banko area, it is evaluated to be viable in view of economic feasibility.
- 2) IRR on the case of distribution to Jakarta area is estimated to be 7.4 10.8%. The economics may be inferior to that of methanol production.
- 3) As for economic comparison for power generation, generating system by fluidized-bed coal-fired steam cycle is slightly superior to that by CGCC though the difference in IRR between two systems is narrow. The results of financial analysis for CGCC power plant are shown in Table 9.

Table 9(*) Results of Financial Analysis for CGCC Power Plant

Case	Supply to Jakarta		Supply to Adjacent Area		(Reference)
	E-5	E-6	E-4	E-1	Base Case
Ex-plant Price of Electricity	43 Rp/ kwH (7.76 ¥ /kwH)	53 Rp/ kwH (9.57 ¥ /kwH)	64 Rp/ kwH (11.55 ¥ /kwH)	78 Rp/ kwH (14.08 ¥ /kwH)	Methanol 194 Rp/kg (35 ¥/kg)
IRR on Total Investment	6.9 %	10.3 %	13.5 %	17.0 %	13.5 %
First Year to Have Profit before Tax (Year from Operation Starts)	11th	7th	3rd	2nd	3rd
Clear off of Accumulated Loss (Year from Operation Starts)	28th	13th	5th	2nd	5th
Pay off of All the Debts (Year from Loan Raised)	28th	15th	12th	12th	12th
Minimum Sales Price (IRR = Interest Rate)	46 Rp/kwH (8.31 ¥/kwH)				143 Rp/kg (25.9 ¥/kg)

Note(*): Cited from Interim Report III (FY1986), page 170.