LAMPIRAN

LAMPIRAN 1: TABEL KONVERSI UNIT

Area (A)

$1\ mm^2 = 1.0 \times 10^{-6}\ m^2$
$1\ cm^2 = 1.0 \times 10^{-4}\ m^2 = 0.1550\ in.^2$
$1\ m^2 = 10.7639\ ft^2$

$1\ ft^2 = 144\ in.^2$
$1\ in.^2 = 6.4516\ cm^2 = 6.4516 \times 10^{-4}\ m^2$
$1\ ft^2 = 0.092\ 903\ m^2$

Conductivity (k)

$1\ W/m\text{-}K = 1\ J/s\text{-}m\text{-}K$
$= 0.577\ 789\ Btu/h\text{-}ft\text{-}^\circ R$

$1\ Btu/h\text{-}ft\text{-}R = 1.730\ 735\ W/m\text{-}K$

Density (ρ)

$1\ kg/m^3 = 0.06242797\ lbm/ft^3$
$1\ g/cm^3 = 1000\ kg/m^3$
$1\ g/cm^3 = 1\ kg/L$

$1\ lbm/ft^3 = 16.018\ 46\ kg/m^3$

Energy (E, U)

$1\ J = 1\ N\text{-}m = 1\ kg\text{-}m^2/s^2$
$1\ J = 0.737\ 562\ lbf\text{-}ft$
$1\ cal\ (Int.) = 4.186\ 81\ J$

$1\ erg = 1.0 \times 10^{-7}\ J$
$1\ eV = 1.602\ 177\ 33 \times 10^{-19}\ J$

$1\ lbf\text{-}ft = 1.355\ 818\ J$
$= 1.285\ 07 \times 10^{-3}\ Btu$
$1\ Btu\ (Int.) = 1.055\ 056\ kJ$
$= 778.1693\ lbf\text{-}ft$

Force (F)

$1\ N = 0.224\ 809\ lbf$
$1\ kp = 9.806\ 65\ N\ (1\ kgf)$

$1\ lbf = 4.448\ 222\ N$

Gravitation

$g = 9.806\ 65\ m/s^2$

$g = 32.174\ 05\ ft/s^2$

Heat capacity (C_p, C_v, C), specific entropy (s)

$1\ kJ/kg\text{-}K = 0.238\ 846\ Btu/lbm\text{-}^\circ R$

$1\ Btu/lbm\text{-}^\circ R = 4.1868\ kJ/kg\text{-}K$

Heat flux (per unit area)

$1\ W/m^2 = 0.316\ 998\ Btu/h\text{-}ft^2$

$1\ Btu/h\text{-}ft^2 = 3.154\ 59\ W/m^2$

(Sumber: Richard E. Sontag, Claus Borgnakke, Fundamentals of Thermodynamics, Edisi ke-6)

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Heat-transfer coefficient (h)

1 W/m²-K = 0.176 11 Btu/h-ft²-°R

1 Btu/h-ft²-°R = 5.678 26 W/m²-K

Length (L)

1 mm = 0.001 m = 0.1 cm
1 cm = 0.01 m = 10 mm = 0.3970 in.
1 m = 3.280 84 ft = 39.370 in.
1 km = 0.621 371 mi
1 mi = 1609.3 m (US statute)

1 ft = 12 in.
1 in. = 2.54 cm = 0.0254 m
1 ft = 0.3048 m
1 mi = 1.609 344 km
1 yd = 0.9144 m

Mass (m)

1 kg = 2.204 623 lbm
1 tonne = 1000 kg
1 grain = 6.479 89 × 10^{-5} kg

1 lbm = 0.453 592 kg
1 slug = 14.5939 kg
1 ton = 2000 lbm

Moment (torque, T)

1 N-m = 0.737 562 lbf-ft

1 lbf-ft = 1.355 818 N-m

Momentum (mV)

1 kg-m/s = 7.232 94 lbm-ft/s
= 0.224 809 lbf-s

1 lbm-ft/s = 0.138 256 kg-m/s

Power ($\dot{Q}$, $\dot{W}$)

1 W = 1 J/s = 1 N-m/s
= 0.737 562 lbf-ft/s
1 kW = 3412.14 Btu/h
1 hp (metric) = 0.735 499 kW

1 lbf-ft/s = 1.355 818 W
= 4.626 24 Btu/h
1 Btu/s = 1.055 056 kW
1 hp (UK) = 0.7457 kW
= 550 lbf-ft/s
= 2544.43 Btu/h

1 ton of refrigeration = 3.516 85 kW

1 ton of refrigeration = 12 000 Btu/h

Pressure (P)

1 Pa = 1 N/m² = 1 kg/m-s²
1 bar = 1.0 × 10^5 Pa = 100 kPa
1 atm = 101.325 kPa
= 1.013 25 bar
= 760 mm Hg [0°C]
= 10.332 56 m H_2O [4°C]
1 torr = 1 mm Hg [0°C]
1 mm Hg [0°C] = 0.133 322 kPa
1 m H_2O [4°C] = 9.806 38 kPa

1 lbf/in.² = 6.894 757 kPa

1 atm = 14.695 94 lbf/in.²
= 29.921 in. Hg [32°F]
= 33.8995 ft H_2O [4°C]

1 in. Hg [0°C] = 0.491 15 lbf/in.²
1 in. H_2O [4°C] = 0.0361 26 lbf/in.²

Specific energy (e, u)

1 kJ/kg = 0.429 92 Btu/lbm
= 334.55 lbf-ft/lbm

1 Btu/lbm = 2.326 kJ/kg
1 lbf-ft/lbm = 2.989 07 × 10^{-3} kJ/kg
= 1.285 07 × 10^{-3} Btu/lbm

(Sumber: Richard E. Sonntag, Claus Borgnakke, Fundamentals of Thermodynamics, Edisi ke-6)

Specific kinetic energy ($\frac{1}{2}\mathbf{V}^2$)

$1\ m^2/s^2 = 0.001\ kJ/kg$
$1\ kJ/kg = 1000\ m^2/s^2$

$1\ ft^2/s^2 = 3.9941 \times 10^{-5}\ Btu/lbm$
$1\ Btu/lbm = 250\ 37\ ft^2/s^2$

Specific potential energy (Zg)

$1\ m\text{-}g_{std} = 9.806\ 65 \times 10^{-3}\ kJ/kg$
$= 4.216\ 07 \times 10^{-3} Btu/lbm$

$1\ ft\text{-}g_{std} = 1.0\ lbf\text{-}ft/lbm$
$= 0.001\ 285\ Btu/lbm$
$= 0.002\ 989\ kJ/kg$

Specific volume (v)

$1\ cm^3/g = 0.001\ m^3/kg$
$1\ cm^3/g = 1\ L/kg$
$1\ m^3/kg = 16.018\ 46\ ft^3/lbm$

$1\ ft^3/lbm = 0.062\ 428\ m^3/kg$

Temperature (T)

$1\ K = 1°C = 1.8\ R = 1.8\ F$
$TC = TK - 273.15$
$= (TF - 32)/1.8$
$TK = TR/1.8$

$1\ R = (5/9)\ K$
$TF = TR - 459.67$
$= 1.8\ TC + 32$
$TR = 1.8\ TK$

Universal Gas Constant

$\bar{R} = N_0 k = 8.314\ 51\ kJ/kmol\text{-}K$
$= 1.985\ 89\ kcal/kmol\text{-}K$
$= 82.0578\ atm\text{-}L/kmol\text{-}K$

$\bar{R} = 1.985\ 89\ Btu/lbmol\text{-}R$
$= 1545.36\ lbf\text{-}ft/lbmol\text{-}R$
$= 0.730\ 24\ atm\text{-}ft^3/lbmol\text{-}R$
$= 10.7317\ (lbf/in.^2)\text{-}ft^3/lbmol\text{-}R$

Velcoity ($\mathbf{V}$)

$1\ m/s = 3.6\ km/h$
$= 3.280\ 84\ ft/s$
$= 2.236\ 94\ mi/h$
$1\ km/h = 0.277\ 78\ m/s$
$= 0.911\ 34\ ft/s$
$= 0.621\ 37\ mi/h$

$1\ ft/s = 0.681\ 818\ mi/h$
$= 0.3048\ m/s$
$= 1.097\ 28\ km/h$
$1\ mi/h = 1.466\ 67\ ft/s$
$= 0.447\ 04\ m/s$
$= 1.609\ 344\ km/h$

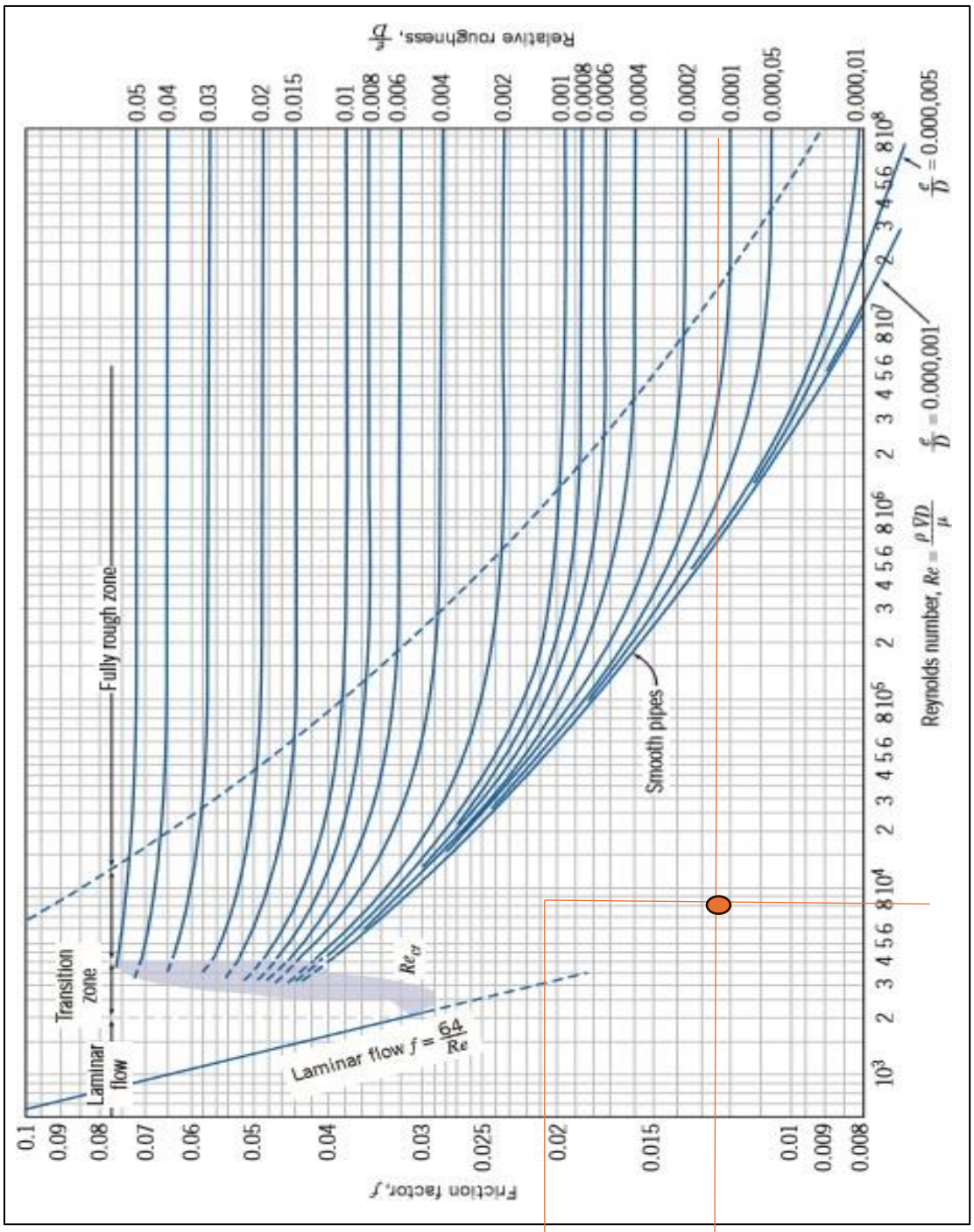
Volume (V)

$1\ m^3 = 35.3147\ ft^3$
$1\ L = 1\ dm^3 = 0.001\ m^3$
$1\ Gal\ (US) = 3.785\ 412\ L$
$= 3.785\ 412 \times 10^{-3}\ m^3$

$1\ ft^3 = 2.831\ 685 \times 10^{-2}\ m^3$
$1\ in.^3 = 1.6387 \times 10^{-5}\ m^3$
$1\ Gal\ (UK) = 4.546\ 090\ L$
$1\ Gal\ (US) = 231.00\ in.^3$

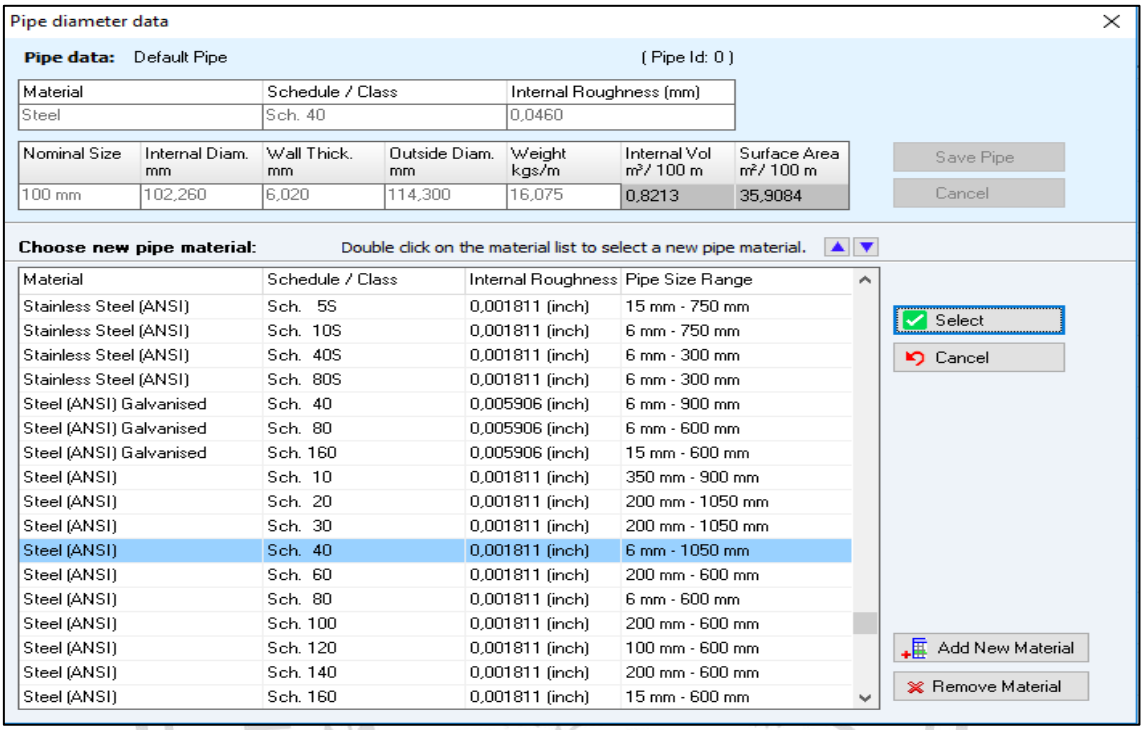
(Sumber: Richard E. Sonntag, Claus Borgnakke, Fundamentals of Thermodynamics, Edisi ke-6)

LAMPIRAN 2: DIAGRAM MOODY



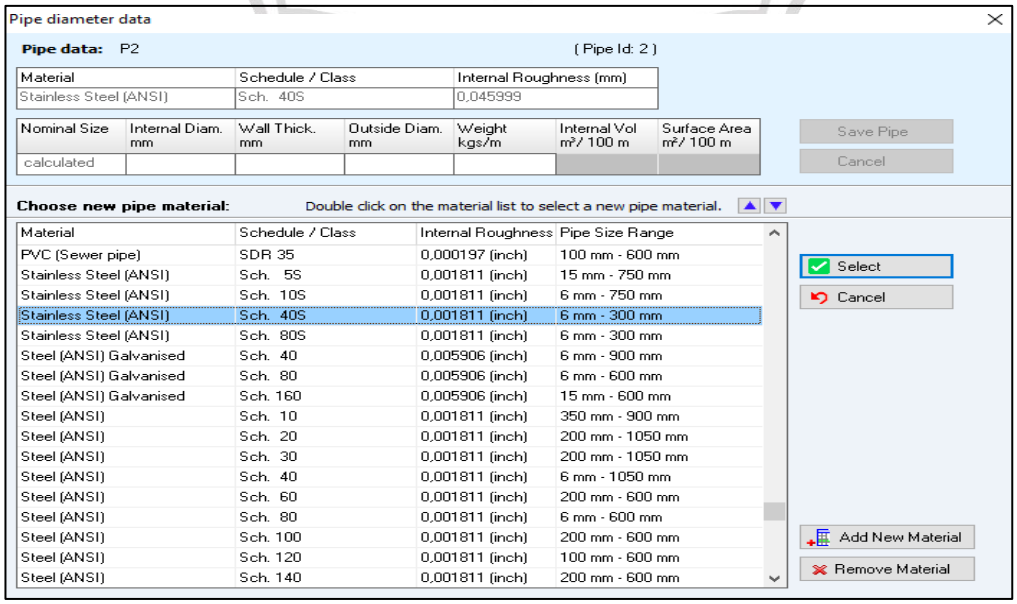
(Sumber: Philip J. Pritchard, Fox and McDonald's Introduction to Fluid Mechanics, Edisi ke-8)

LAMPIRAN 3: TABEL KEKASARAN MATERIAL BAGIAN DALAM PIPA STEEL



(Sumber: Software Pipe Flow Expert versi 6.38)

LAMPIRAN 4: TABEL KEKASARAN MATERIAL BAGIAN DALAM PIPASTAINLESS STEEL



(Sumber: Software Pipe Flow Expert versi 6.38)

Lampiran 5: Gambar Indikator Tekanan Suction dan Tekanan Discharge.

Lampiran 6: Data Pompa Sirkulasi Low Pressure Boiler

CMI ENERGY DIVISION

GRESIK
Combined cycle power plant
Heat Recovery Steam Generator

Operation & Maintenance Manual

Chapter 3 : Mechanical equipment

3.3 Heat Recovery Steam Generator

3.3.1 Pumps

Volume : 21 - 1

1) LP - Boiler circulating pumps
ENSIVAL - type : CN 100 - 20

1.3 - Data sheet

Ensival — 6 GROUPS CN 100-20 PUMPS — DAT. 9101865

1	Buyer CMI									1
2	Buyer's ref P.O. mr 900/E1/91/0105 3/E2									2
3	Buyer's item n° 21-22-23 HAG10-AP001KP, 21-22-23 HAG10-AP002KP									3
4	Duty LP circulation pumps									4
5	Final user									5
6	Liquid boiler Feed water									6
7	Norm. temperature °C 162 max min				Dissolved gases	Yes	No			7
8	Viscosity mm²/s cSt Norm Max				Corrosion	Yes	No			8
9	Max specific mass kg/dm³ 0.9053				Erosion	Yes	No			9
10	Solids % in weight				Incrustation	Yes	No			10
11	Sol specific mass kg/dm³ Grain μ =				Crystallization	Yes	No			11
12	Solids nature				Explosion danger	Yes	No			12
13	Pressure at the suction flange bar ~~abs~~ 7.49 ATA				Continuous duty	Yes	No			13
14	suction head : 14 m				Toxical	Yes	No			14
15	Vapour pressure ~~bar abs~~ 6.63 kg/cm² abs				Suction filter	Yes	No			15
16	Available NPSH m					Yes	No			16
17						Yes	No			17
18	PUMP CHARACTERISTICS				RECEPTION	Yes	No			18
19	Capacity m³/h Nom 93.9 Max min				Materials ac	Yes	No			19
20	Tot head m Nom 13.5 Shut-off valve ±				Hydrost test 1½ bar	Yes	No			20
21	Required NPSH m ±				m³/h m kW Spits	Yes	No			21
22	Speed rpm 1470				NPSH Tpl	Yes	No			22
23	Abs power at s/gr (kW) Nom 4.3 max				1 pump per ~~lab~~ type	Yes	No			23
24	Min. driving power (kW) 5.5				~~ISO 9908 Cl. —~~	Yes	No			24
25	Type single-stage centrifugal 2				Vibrations	Yes	No			25
26	Axis horizontal ~~vertical~~				Noise 85 dB(A) at 1 m	Yes	No			26
27	Bearing frame(s) lubric oil ~~grease~~				~~Shop test~~ Balancing ac	Yes	No			27
28	Quantity of oil per pump 0.7 l				Dimensional	Yes	No			28
29					Other norms PTC 8.2					29
30					ac Certificates 5004.8.3.1.B					30
31	Impeller diam. (mm) foreseen Ø209 fitted				DRIVING					31
32	Materials				Elect ~~Diesel~~ Turb Other					32
33	Pump casing (volute) cast steel A216 WCB				Type IEC 132 M					33
34	Stuffing box cast steel A216 WCB				7.5 kW 1470 tr/min					34
35	Impeller (s) 13% Cr+Ni steel A743 CA6NM				Supply Ensival Client					35
36	Casing-impeller wear rings : 13% Cr AISI 410 steel				Direct ~~Belt~~ Reducer Variant					36
37	Impeller hub cap + plug 13% Cr AISI 410 steel				Type ARPEX coupling					37
38	Shaft sleeve AISI 316 S.S.									38
39	Pump shaft 42 Cr Mov steel				Supply Ensival Client					39
40	Adapter frame nodular cast iron				Shaft seal					40
41	Gland				FLEXIBOX mech. seal					41
42	O-Ring on rotor ethylene propylene				ISOFLEX B3 FK					42
43	Bearing frame (s) : cast iron				API 682 + cooling of					43
44	Pump base welded steel				stuffing box					44
45										45
46	Gaskets									46
47	NOTES Flanges ANSI lbs 150									47
48										48
49										49

	MODIFICATIONS	Carried out		Imputation	Date	Visa		
50								50
51		Yes	No					51
52		Yes	No					52
53		Yes	No					53
54		Yes	No					54

Ensival	6 GROUPS CN 100-20 PUMPLE	DAT. 91 01868			
1	Buyer CMI				
2	Buyer's ref P.O. mr 900/E1/91/07053/E2				
3	Buyer's item n° 31-32-33 HAG 10-AP001 KP, 31-32-33 HAG 10-AP002 KP				
4	Duty LP circulation pumps				
5	Final user				
6	Liquid boiler feed water				
7	Nom temperature °C 162 max min	Dissolved gases	Yes	No	55
8	Viscosity mm²/s cSt Nom Max	Corrosion	Yes	No	56
9	Mixt specific mass kg/dm³ 0.9053	Erosion	Yes	No	57
10	Solids % in weight	Incrustation	Yes	No	58
11	Sol specific mass kg/dm³ Grain μ =	Crystallization	Yes	No	59
12	Solids nature	Explosion danger	Yes	No	60
13	Pressure at the suction flange bar eff 7.49 ATA	Continuous duty	Yes	No	61
14	suction head: 14 m	Toxical	Yes	No	62
15	Vapour pressure bar eff: 6.63 kg/cm² abs.	Suction filter	Yes	No	63
16	Available NPSH m		Yes	No	64
17			Yes	No	66
18	PUMP CHARACTERISTICS	RECEPTION	Yes	No	66
19	Capacity m³/h Nom. 93.9 Max min	Materials *	Yes	No	67
20	Tot head m Nom 13.5 Shut-off valve ±	Hydrost test 15 bar	Yes	No	68
21	Required NPSH m 2	m³/h m kW 5 pts	Yes	No	69
22	Speed rpm 1470	NPSH 1 pt	Yes	No	70
23	Abs. power at s/gr (kW) Nom. 4.3 max	1 pump per tab type	Yes	No	71
24	Min. driving power (kW) 5.5	ISO 2548 C	Yes	No	72
25	Type single-stage centrifugal 2	Vibrations	Yes	No	73
26	Axis horizontal vertical	Noise 85 dB(A) at 1 m	Yes	No	74
27	Bearing frame(s) lubric. oil grease	Strip-test Balancing *	Yes	No	75
28	Quantity of oil per pump: 0.7 ℓ	Dimensional	Yes	No	76
29		Other norms PTC 8.2			77
30		* Certificates 50049.3.1.B			78
31	Impeller diam. (mm) foreseen Ø209 fitted	DRIVING			79
32	Materials	Elect Therm Turb Other			80
33	Pump casing (volute) cast steel A216 WCB	Type IEC 132 M			81
34	Stuffing box: cast steel A216 WCB	7,5 kW 1470 tr/min			82
35	Impeller (s): 13% Cr+Ni steel A743 CA 6 NM	Supply Ensival Client			83
36	Casing-impeller wear rings: 13% Cr AISI 410 steel	Direct Gearbox Reducer Variat			84
37	Impeller hub cap + plug: 13% Cr AISI 410 steel	Type ARPEX coupling			85
38	Shaft sleeve: AISI 316 S.S.				86
39	Pump shaft: 42 Cr Mo4 steel	Supply Ensival Client			87
40	Adapter frame nodular cast iron	Shaft seal			88
41	Gland:	FLEXIBOX mech. seal			89
42	O-Ring on rotor: ethylene propylene	ISOFLEX B2 FK			90
43	Bearing frame (s): cast iron	API 02 + cooling of			91
44	Pump base: welded steel	stuffing box			92
45					93
46	Gaskets				94
47	NOTES Flanges ANSI lbs 150				
48					
49					

	MODIFICATIONS	Carried out		Imputation	Date	Visa
50						
51		Yes	No			
52		Yes	No			
53		Yes	No			
54		Yes	No			

Ensival	GRESIK		490.030
TIGHTENING TORQUES			
LP CIRCULATION PUMPS	Position	Thread	Torque Nm
PUMP TYPE: CN 100-20 FABRICATION: 91.01862.00, 91.01865.00, 91.01868.00 ITEM: 11-21-31 HAG 10 AP001 KP, 11-21-31 HAG 10 AP002 KP	Casing nuts	M16	75
	Impeller screw	M12	60
12-22-32 HAG 10 AP001 KP, 12-22-32 HAG 10 AP002 KP 13-23-33 HAG 10 AP001 KP, 13-23-33 HAG 10 AP002 KP	M.S. cover screws	M12	28
PUMP TYPE: PRNR 200-40 A FABRICATION: 91.01863.00, 91.01866.00, 91.01869.00	Casing nuts	M27	1210
ITEM: 11-21-31 HAG 20 AP001 KP, 11-21-31 HAG 20 AP002 KP	Impeller hub cap	M36 X 4	1800
12-22-32 HAG 20 AP001 KP, 12-22-32 HAG 20 AP002 KP 13-23-33 HAG 20 AP001 KP, 13-23-33 HAG 20 AP002 KP	M.S cover screws	M16	245
PUMP TYPE: CN 80-32 FABRICATION: 91.01864.00	Casing nuts	M16	75
91.01867.00, 91.01870.00 ITEM:	Impeller screw	M16	110
10-20-30 LAC 10 AP001 KP, 10-20-30 LAC 10 AP002 KP, 10-20-30 LAC 10 AP003 KP, 10-20-30 LAC 10 AP004 KP	M.S cover screws	M12	24
JPG-HJ-ib			17-12-92

Chapter 3 : Mechanical equipment

3.3 Heat Recovery Steam Generator

3.3.1 Pumps

Volume : 21 - 1

1) LP - Boiler circulating pumps
ENSIVAL - type : CN 100 - 20

1.4 - Performance test report

Ensival

Guarantees m³/h	m	rpm	kW with η1	kW with η	NPSHr	Effic.
93,9	13,5	1470	4,75	4,3	0,9053	2	78,72

Calibration: Standard / Mano

Starting / Stopping — Kinetic energy readings: Suction ø 125, Discharge 100, -5 ω²/2g, 3,76 m. for 1 m³/h

MOTOR : Client - AC.EC
Type AKF 132 M14 — kW 7,5 — Amp 15,7 — rpm 1435
N° 1903288L001
Drive: Direct — Voltage: 380 Δ — Efficiency: T 3946 %

For agreement Pump — 0,08

Date: 23/04/98
Pump Group: CN 100-20
Fabrication: 91.01868.00
Item: –
Test nr: 2

N°	Speed rpm	DELIVERY Scale 3 Coefficient 0,1 Reading	m³/h	TOTAL HEAD Scale 20 Coefficient 0,01 ω²/2g	Reading	m	Total head m	Gr consumption Scale 20 Coefficient 8 Reading	kW Group	η % Gr	Pump consumption η % mot	kW pump	η % pump	Suction capacity mm Hg 748,3 Atm pressure 10,10 m wc Water T° 21,6°C Reading m	Suction pressure (suction)	ω²/2g	NPSH
1	1476	939	939	0,33	1334	13,34	13,67	703	5,62		84,9	4,77	73,26				
2	1474	1035	103,5	0,40	1289	12,89	13,29	730	5,84		85,0	4,96	75,52				
3	1476	715	71,5	0,19	1393	1393	14,12	639	5,11		84,7	4,33	63,54				
4	1470	1190	119,0	0,53	1177	11,77	12,30	766	6,13		85,0	5,21	76,59				
5	1474	837	83,7	0,26	1359	1359	13,85	670	5,36		84,8	4,55	69,51				
6	1477	573	57,3	0,18	1428	14,28	14,40	598	4,78		84,3	4,03	55,76				
7	1479	379	37,9	0,05	1480	14,80	14,85	539	4,31		83,9	3,68	42,40				
8	1481	219	21,9	0,02	1511	15,11	15,13	491	3,93		83,7	3,89	27,46				
9	1488	—	5,0	—	1537	15,37	15,37	483	3,86		83,5	3,23	—				
10	1478	937	93,7	0,33	1320	13,20	13,53	700	5,60		84,9	4,75	78,66	-3,00		0,23	1,99
11																	
12																	
13		Noise level		75 dBA									SES				
14				at 1m													
15							B. MANVILLE										

Annexure to diagram R.91.01868/2

R340/1CE/A

Ensival — Mesures vibrations

Type CN 100-20
Fab 91.0186200
Date 23/04/92
Opérateur BM

(1) Palier côté commande
~~2 Palier opposé à la commande~~
Plage de mesure 900 RPM à 60 000 RPM

		Q m³/h	Points de mesure 1V	1H	1A	~~2V~~	~~2H~~	~~2A~~
Σ en mm/sec RMS		93,9	0,74	0,45	0,36			
		103,5	0,70	0,40	0,34			
		71,5	1,2	0,80	0,60			
		119	0,70	0,48	0,35			
Filtre à x RPM		83,7	0,74	0,55	0,68			
		57,3	1,01	1,30	0,72			
		37,9	1,41	1,73	1,20			
		219	1,48	1,72	0,73			
Filtre à x RPM								
Filtre à x RM								

B. MONVILLE

Remarques

Etabli par JMO — 11 / 90

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Chapter 3 : Mechanical equipment

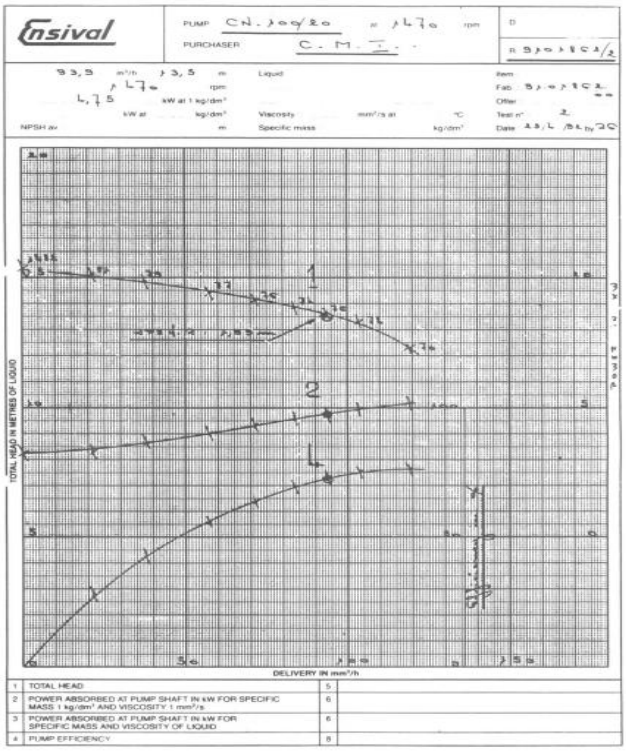
3.3 Heat Recovery Steam Generator

3.3.1 Pumps

Volume : 21 - 1

1) LP - Boiler circulating pumps
ENSIVAL - type : CN 100 - 20

1.5 - Performance curves



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Chapter 3 : Mechanical equipment

3.3 Heat Recovery Steam Generator

3.3.1 Pumps

Volume : 21 - 1

1) LP - Boiler circulating pumps
ENSIVAL - type : CN 100 - 20

1.6 - Drawings

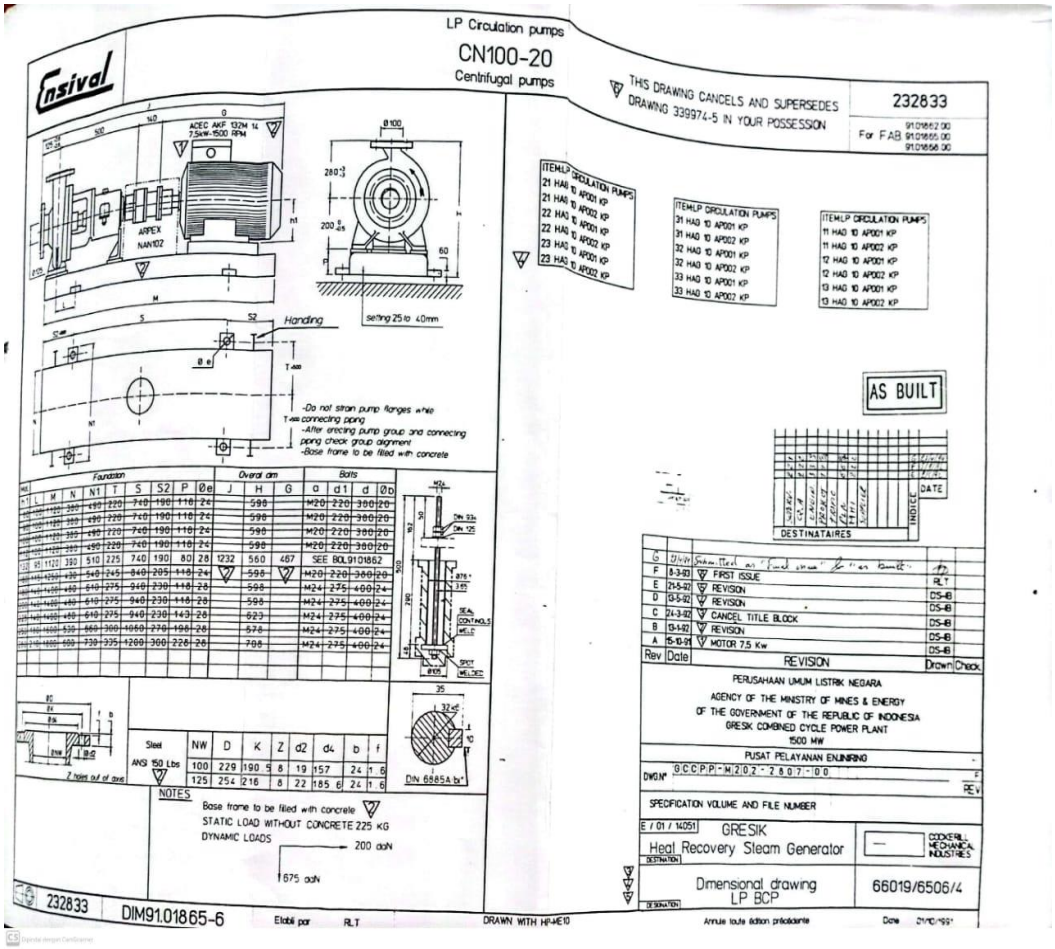
COCKERILL MECHANICAL INDUSTRIES

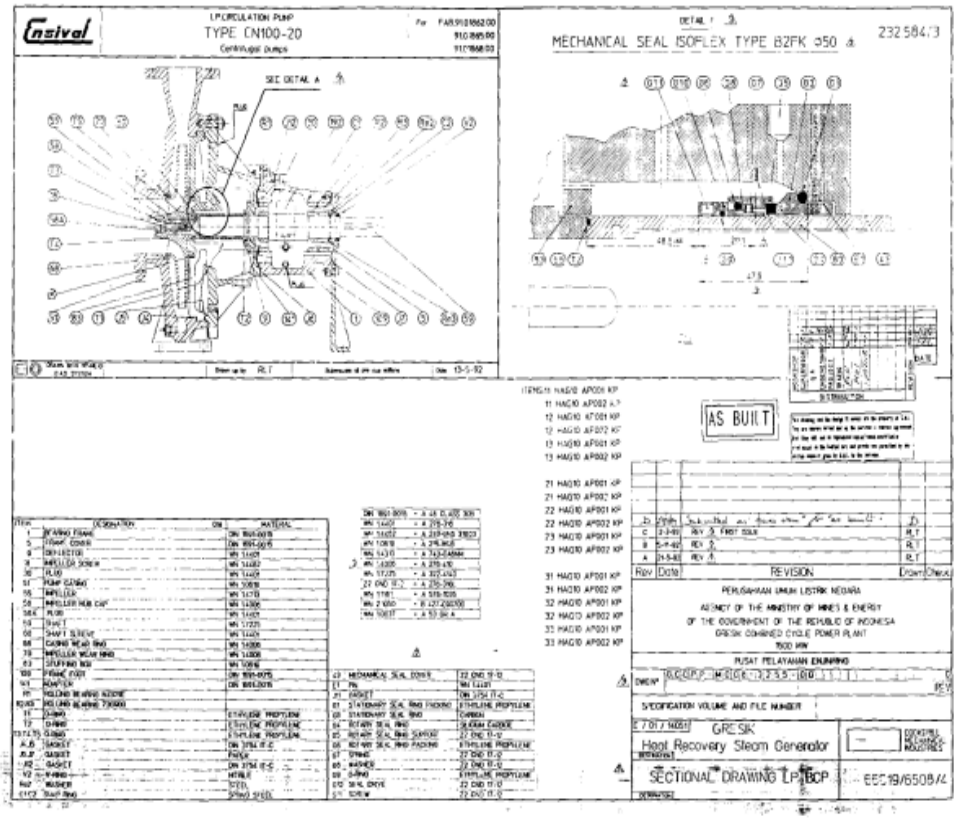
Chapter 3.3.1 - Volume 21.1

SECTION 1.6

DRAWINGS LIST

Drawing N° :	Drawing title :
66019/6506/2	Dimensional drawing
66019/6507/2	Tempory filter
66019/6508/4	Sectional drawing
66019/6509/6	Pipe and connection

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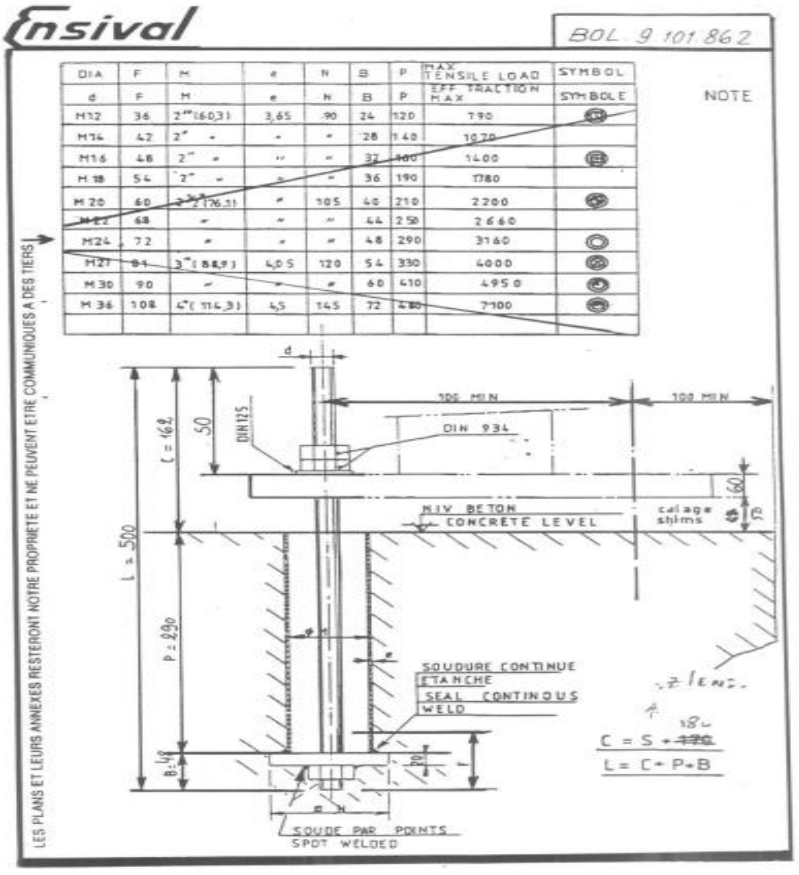
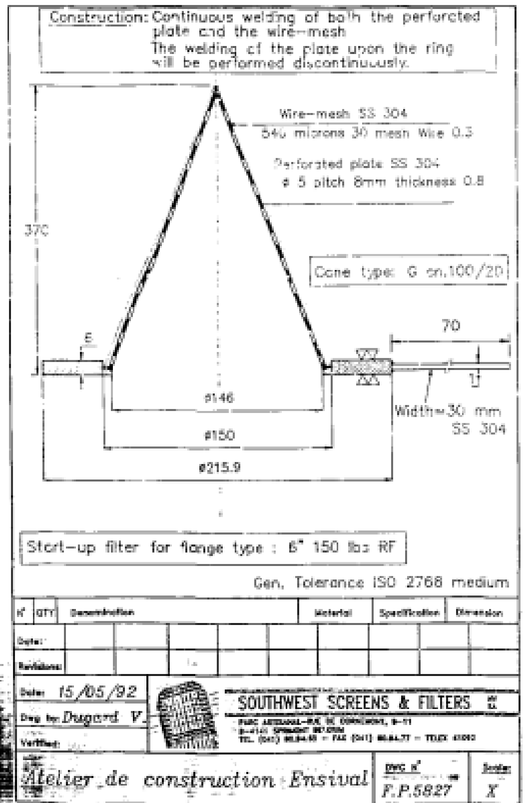
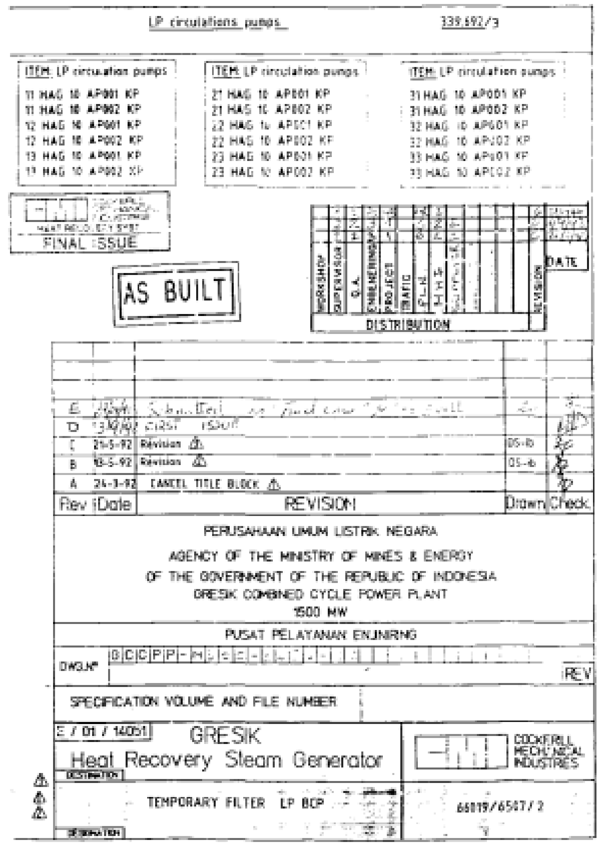
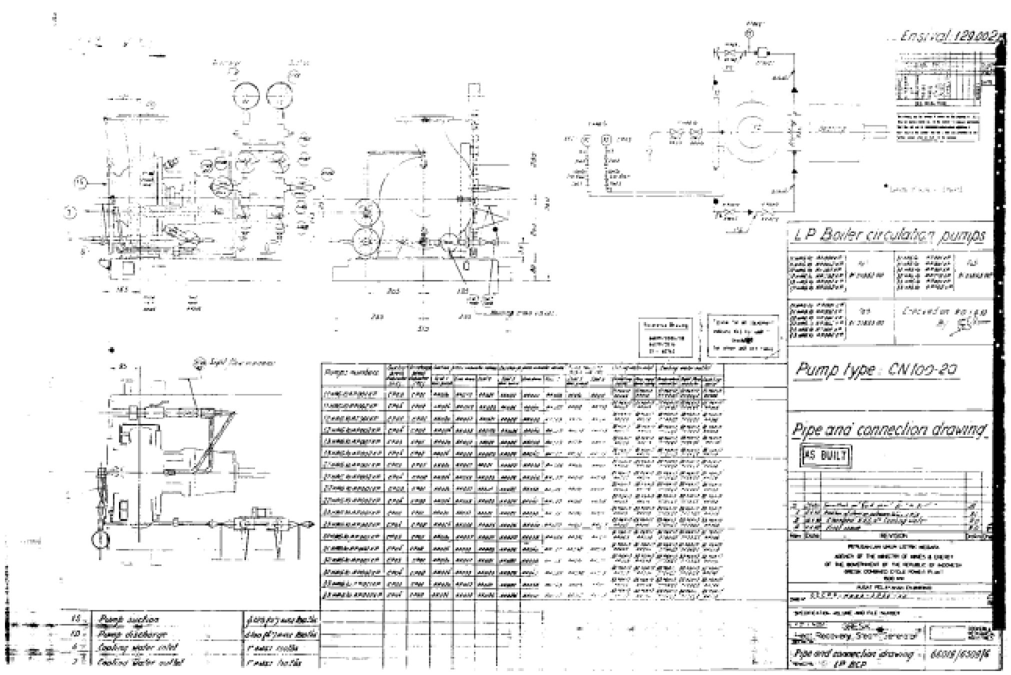
LP CIRCULATION PUMP
TYPE CN100-20
Centrifugal pumps
MECHANICAL SEAL ISOFLEX TYPE BZFK ø50
AS BUILT
REVISION
PERUSAHAAN UMUM LISTRIK NEGARA
AGENCY OF THE MINISTRY OF MINES & ENERGY
OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
GRESIK COMBINED CYCLE POWER PLANT
1500 MW
PUSAT PELAYANAN ENJINIRING
Heat Recovery Steam Generator
SECTIONAL DRAWING LP BCP

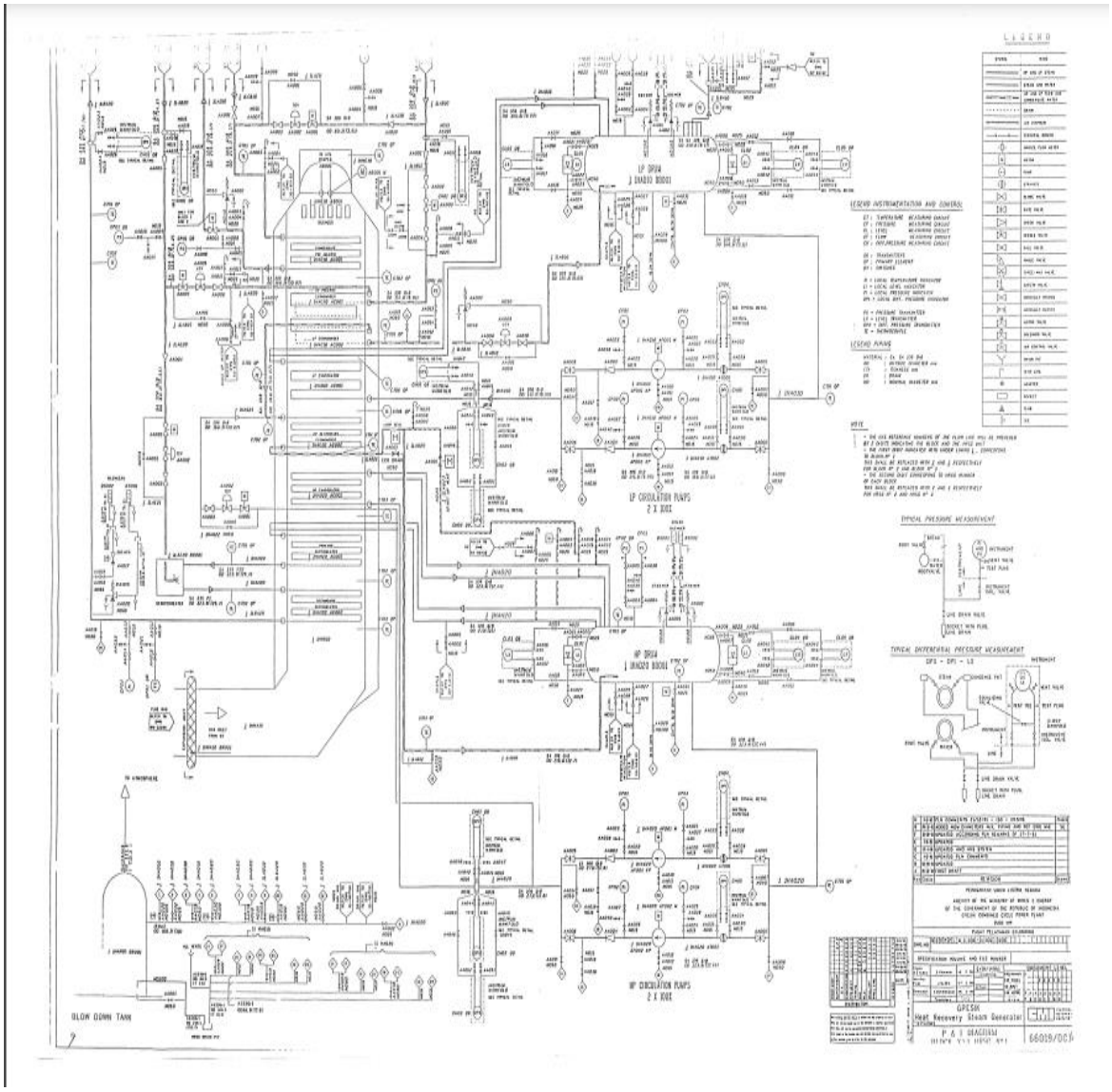

Ensival
BOL 9 101 862
NOTE
LES PLANS ET LEURS ANNEXES RESTERONT NOTRE PROPRIETE ET NE PEUVENT ETRE COMMUNIQUES A DES TIERS
SOUDURE CONTINUE ETANCHE
SEAL CONTINOUS WELD
SOUDE PAR POINTS
SPOT WELDED
DIN 934
DIN 125
NIV BETON
CONCRETE LEVEL
calage shims
C = S +
L = C + P + B

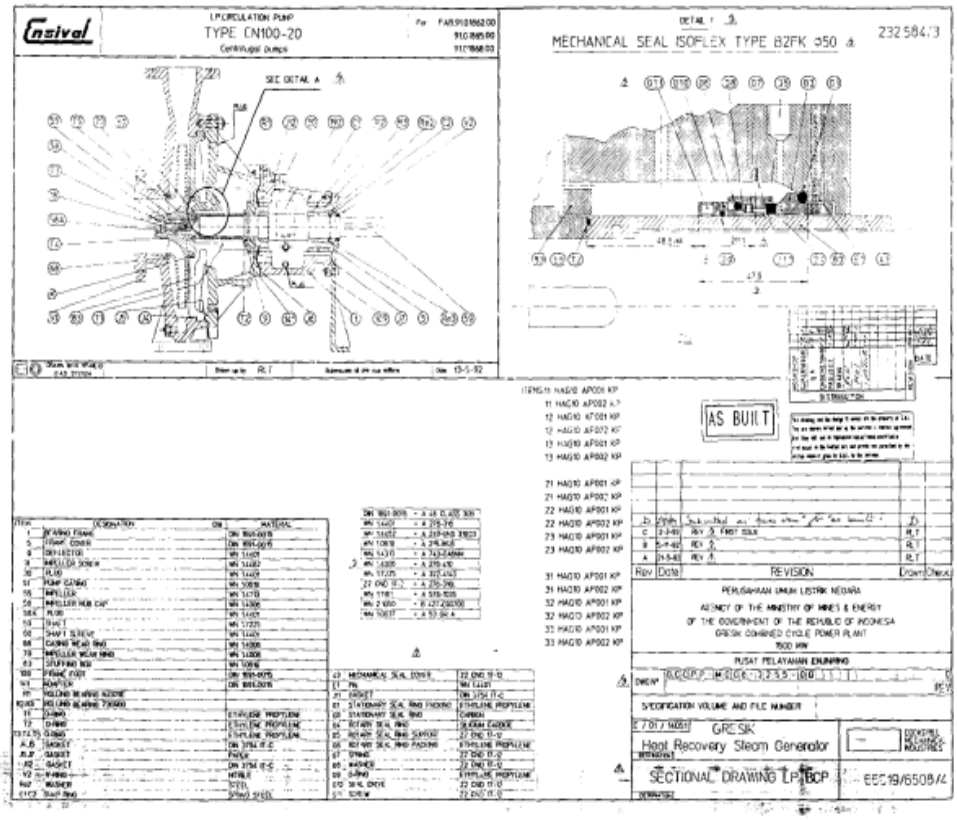

Construction: Continuous welding of both the perforated plate and the wire-mesh
The welding of the plate upon the ring will be performed discontinuously.
Wire-mesh SS 304
540 microns 30 mesh Wire 0.3
Perforated plate SS 304
ø 5 pitch 8mm thickness 0.8
370
Cone type: G cn.100/20
70
E
ø146
ø150
ø215.9
Width=30 mm
SS 304
Start-up filter for flange type : 6" 150 lbs RF
Gen. Tolerance ISO 2768 medium
N° QTY Denomination Material Specification Dimension
Date:
Revisions:
Date: 15/05/92
Drg by: Dugard V.
Verified:
SOUTHWEST SCREENS & FILTERS
Atelier de construction Ensival
DWG N° F.P.5827
Scale: X


LP circulations pumps
339.692/3
ITEM: LP circulation pumps
11 HAG 10 AP001 KP
11 HAG 10 AP002 KP
12 HAG 10 AP001 KP
12 HAG 10 AP002 KP
13 HAG 10 AP001 KP
13 HAG 10 AP002 KP
ITEM: LP circulation pumps
21 HAG 10 AP001 KP
21 HAG 10 AP002 KP
22 HAG 10 AP001 KP
22 HAG 10 AP002 KP
23 HAG 10 AP001 KP
23 HAG 10 AP002 KP
ITEM: LP circulation pumps
31 HAG 10 AP001 KP
31 HAG 10 AP002 KP
32 HAG 10 AP001 KP
32 HAG 10 AP002 KP
33 HAG 10 AP001 KP
33 HAG 10 AP002 KP
FINAL ISSUE
AS BUILT
WORKSHOP
SUPERVISOR
Q.A.
ENGINEERING
PROJECT
DISTRIBUTION
REVISION
DATE
D FIRST ISSUE
C 24-5-92 Révision
B 18-5-92 Révision
A 24-3-92 CANCEL TITLE BLOCK
Rev Date REVISION Drawn Check.
PERUSAHAAN UMUM LISTRIK NEGARA
AGENCY OF THE MINISTRY OF MINES & ENERGY
OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
GRESIK COMBINED CYCLE POWER PLANT
1500 MW
PUSAT PELAYANAN ENJINIRING
DWG.N° GCCPP-H
REV
SPECIFICATION VOLUME AND FILE NUMBER
E / 01 / 14051
GRESIK
Heat Recovery Steam Generator
COCKERILL MECHANICAL INDUSTRIES
DESTINATION
TEMPORARY FILTER LP BCP
65019/6507/2
DESIGNATION


Ensival 129002
L P Boiler circulation pumps
Pump type : CN 100-20
Pipe and connection drawing
AS BUILT
Pump numbers
15 Pump suction
10 Pump discharge
6 Cooling water inlet
7 Cooling water outlet
GRESIK
Heat Recovery Steam Generator
Pipe and connection drawing LP BCP
65019/6509/6

Lampiran 7: Gambar Diagram Pompa Sirkulasi




Ensival
LP CIRCULATION PUMP
TYPE CN100-20
Centrifugal pumps
MECHANICAL SEAL ISOFLEX TYPE BZFK ø50
AS BUILT
REVISION
PERUSAHAAN UMUM LISTRIK NEGARA
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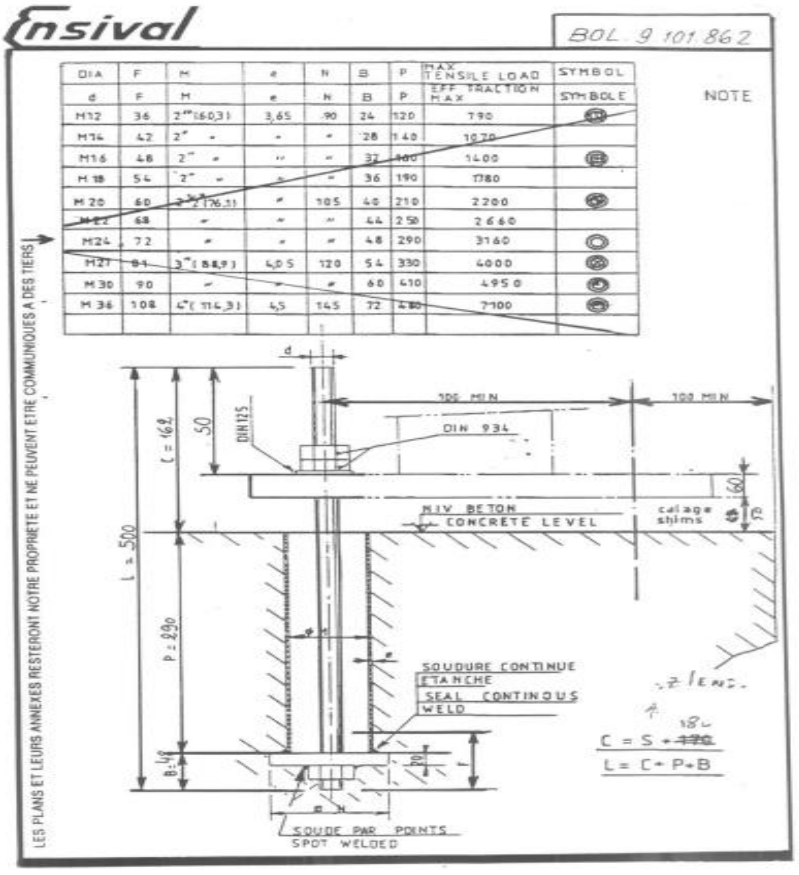
OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
GRESIK COMBINED CYCLE POWER PLANT
1500 MW
PUSAT PELAYANAN ENJINIRING
Heat Recovery Steam Generator
SECTIONAL DRAWING LP BCP


Ensival
BOL 9 101 862
NOTE
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CONCRETE LEVEL
calage shims
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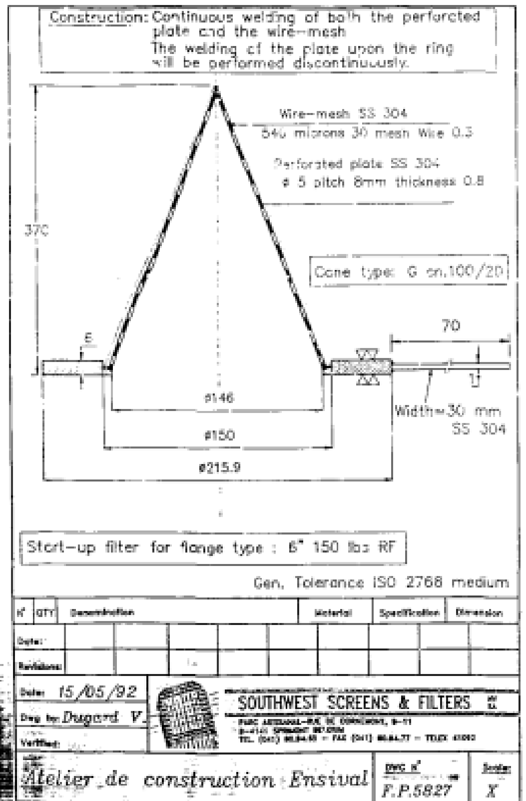
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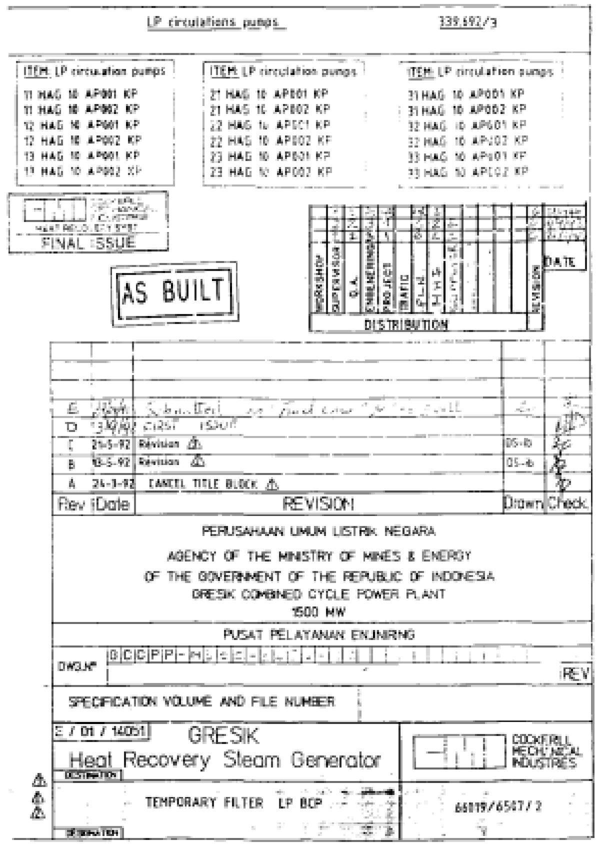
Wire-mesh SS 304
540 microns 30 mesh Wire 0.3
Perforated plate SS 304
ø 5 pitch 8mm thickness 0.8
370
Cone type: G cn.100/20
70
E
ø146
ø150
ø215.9
Width=30 mm
SS 304
Start-up filter for flange type : 6" 150 lbs RF
Gen. Tolerance ISO 2768 medium
N° QTY Denomination Material Specification Dimension
Date:
Revisions:
Date: 15/05/92
Drg by: Dugard V.
Verified:
SOUTHWEST SCREENS & FILTERS
Atelier de construction Ensival
DWG N°
F.P.5827
Scale:
X


LP circulations pumps
339.692/3
ITEM: LP circulation pumps
11 HAG 10 AP001 KP
11 HAG 10 AP002 KP
12 HAG 10 AP001 KP
12 HAG 10 AP002 KP
13 HAG 10 AP001 KP
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22 HAG 10 AP002 KP
23 HAG 10 AP001 KP
23 HAG 10 AP002 KP
ITEM: LP circulation pumps
31 HAG 10 AP001 KP
31 HAG 10 AP002 KP
32 HAG 10 AP001 KP
32 HAG 10 AP002 KP
33 HAG 10 AP001 KP
33 HAG 10 AP002 KP
FINAL ISSUE
AS BUILT
WORKSHOP
SUPERVISOR
Q.A.
ENGINEERING
PROJECT
TRAFIC
REVISION
DATE
DISTRIBUTION
D FIRST ISSUE
C 24-5-92 Revision
B 18-5-92 Revision
A 24-3-92 CANCEL TITLE BLOCK
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PERUSAHAAN UMUM LISTRIK NEGARA
AGENCY OF THE MINISTRY OF MINES & ENERGY
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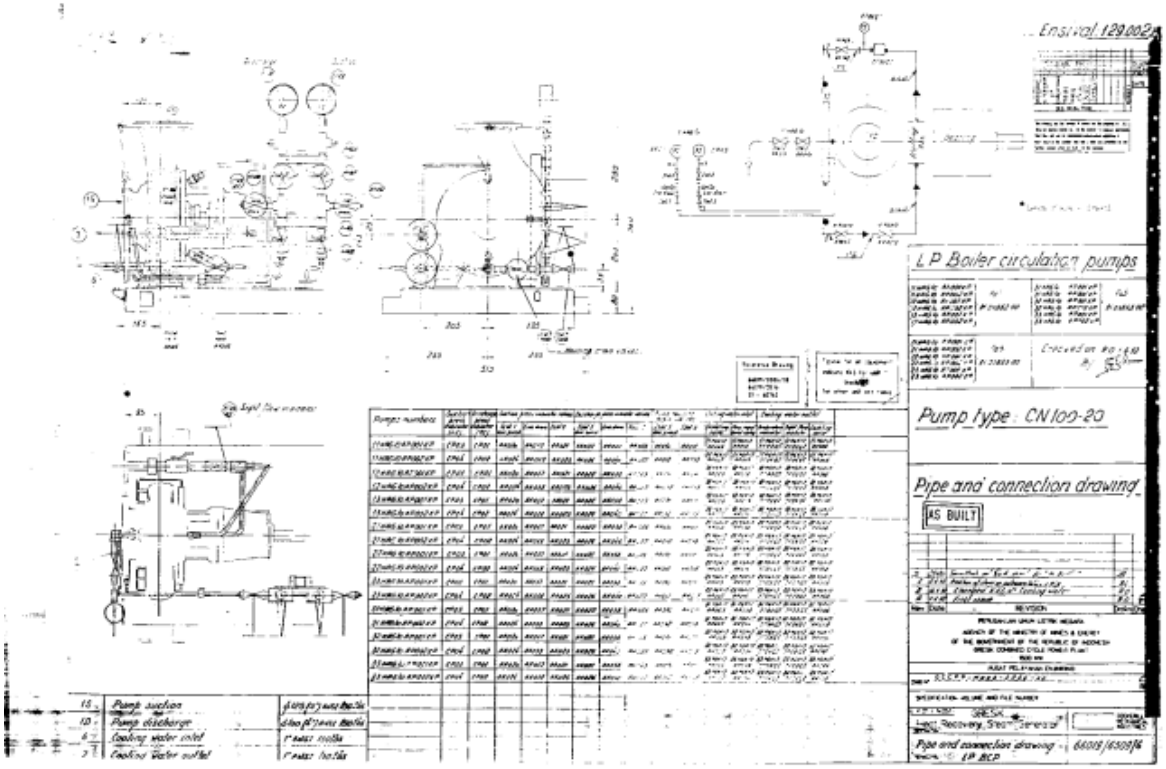
GRESIK COMBINED CYCLE POWER PLANT
1500 MW
PUSAT PELAYANAN ENJINIRING
DWG.N°
REV
SPECIFICATION VOLUME AND FILE NUMBER
E / 01 / 14051
GRESIK
Heat Recovery Steam Generator
DESTINATION
COCKERILL MECHANICAL INDUSTRIES
TEMPORARY FILTER LP BCP
DESIGNATION


Ensiral 129002
LP Boiler circulation pumps
Pump type : CN 100-20
Pipe and connection drawing
AS BUILT
Pump suction
Pump discharge
Cooling water inlet
Cooling water outlet
Recovery Steam Generator
Pipe and connection drawing - 66018/65018

Lampiran 8: Gambar Diagram Pompa Sirkulasi