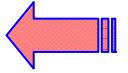




*L'energia che ti ascolta*  
*Divisione Generazione ed*  
*Energy Management-PT-PCA*  
*Area di Business Termoelettrica*  
*U.B. Fusina*



**Allegato FS\_B18\_AC9\_AC10**

## **CENTRALE TERMOELETTRICA DI FUSINA**

**Impianti trattamento reflui (ITAR, ITSD, ITAA, SEC)**

Di seguito sono allegati gli schemi di flusso degli impianti di trattamento acque della centrale di Fusina:

- [ITAR](#)
- [ITSD](#)
- [ITAA](#)
- [SEC – parte 1](#)
- [SEC - parte 2.](#)





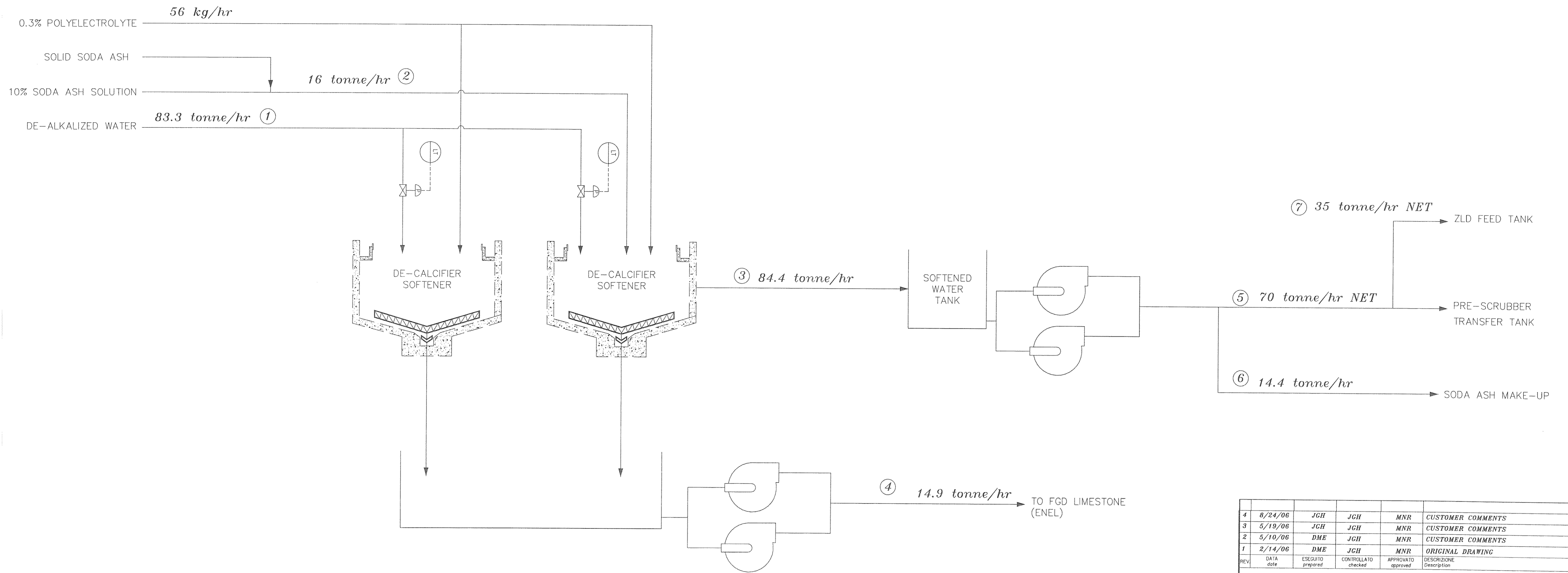








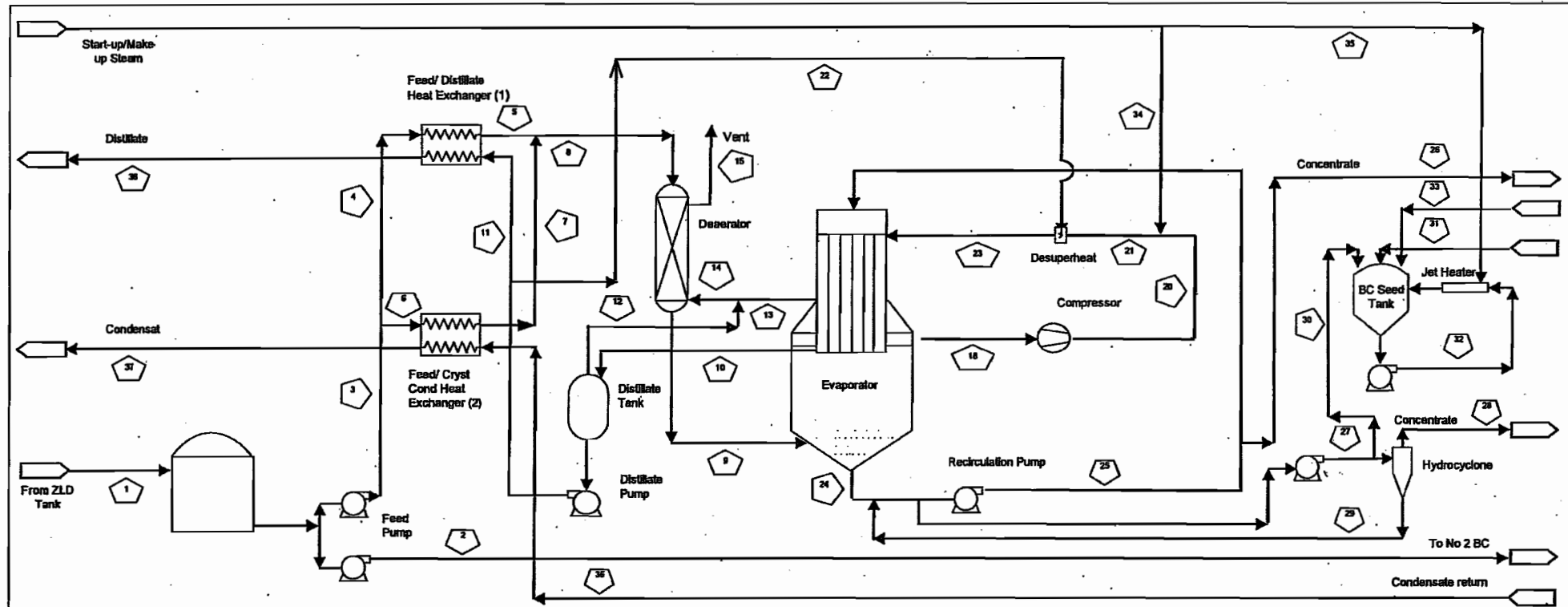




# DESIGN CASE

	1	2	3	4	5	6	7
<b>FLOW RATE</b>	84.2 tonne/hr	16.0 tonne/hr	84.4 tonne/hr	14.9 tonne/hr	70 tonne/hr NET	14.4 tonne/hr	35 tonne/hr NET
<b>pH</b>	9.5	11.7	9.5	9.5	9.5	9.5	9.5
<b>TDS(mg/kg)</b>	42,087		44,258	44,258	44,258	44,258	44,258
<b>TSS (mg/kg)</b>	80		50	100,000	50	50	50
<b>Ca (as CaCO3)</b>	17,500		125		125	125	125
<b>Mg (as CaCO3)</b>	1030		1030		1030	1030	1030
<b>SPECIFIC GRAVITY</b>	1.02	1.12	1.02	1.09	1.02	1.02	1.02

4	8/24/06	JGH	JGH	MNR	CUSTOMER COMMENTS
3	5/19/06	JGH	JGH	MNR	CUSTOMER COMMENTS
2	5/10/06	DME	JGH	MNR	CUSTOMER COMMENTS
1	2/14/06	DME	JGH	MNR	ORIGINAL DRAWING
REV.	DATA date	ESEGUITO Prepared	CONTROLLATO Checked	APPROVATO Approved	DESCRIZIONE Description
IMPIANTO Plant	FUSINA		COMMESSA Job	DATA Date	2/14/06
	CLIENTE Customer	ENEL POWER		ESEGUITO Prepared	JGH
				CONTROLLATO Checked	JGH
TITOLO Title	PROCESS FLOW DIAGRAM & MASS BALANCE FOR PRE-TREATMENT SECTION		LOCALITA' Site	APPROVATO Approved	MNR
			No DISEGNO / Drawing No		
			P-30020-DW-AE-001F1-C		
	FOGLIO Sheet	1	DI OF	1	
ASSOCIAZIONE TEMPORANEA DI IMPRESE TEMPORARY ASSOCIATION OF COMPANIES					
MANDATARIA LEADER	AQUATECH INTERNATIONAL CORPORATION		MANDANTE PARTNER	CARLO GAVAZZI IMPIANTI SpA	
	ONE FOUR CORNS DRIVE CANONSBURG, PA. 15317 - USA			VA CARLO GAVAZZI Nr.100 MARCALLO CON CASONE - 20013 (MI) - ITALIA	
ESITO SUPERVISIONE Supervision Outcome					
REV.	DATA Date	ISSUE Scope	ESAMINATO Supervised by	COLLABORAZIONI Cooperations	CONTROLLATO Checked By
Enel		DOCUMENTO Document no		PBFUA85004	
DIVISIONE GEM/SRI				Indice Sicurezza Security Index	
INOLTRO AD ENEL PRODUZIONE SpA. Employer submitted					
SISTEMA System		92C	TIPO DOCUMENTO Document type	DJ	DISCIPLINA Discipline
				P	FILE PBFUA85004-04.DWG
L'APPROVAZIONE DI GEM / SRI E' LIMITATA AGLI ASPETTI RELATIVI ALLE PRESCRIZIONI CENTRALI, RIMANENDO PERTANTO A CARICO DEL FORNITORE TUTTA LA RESPONSABILITA' DELLA PROIEZIONE. The GEM / SRI approval refers to contractual requirements and clauses only. All design responsibilities remain charged to the Supplier.					
PROGETTO Project					
IMPIANTO TERMOELETTRICO DI FUSINA Ambientilizzazione delle sezz. 1-2					
CLIENTE Client					
DIVISIONE GENERAZIONE ED ENERGY MANAGEMENT Enel Produzione Spa					
Enel					
INOLTRO AL CLIENTE Employer submitted					
		PER APPROVAZIONE For approval	PER INFORMAZIONE For information only	NON RICHIESTO Not requested	



- NOTES:**
1. FEED TANK, DEAERATOR, & EVAPORATOR ARE SUPPLIED AS 2 X 50% TRAINS.
  2. STEAM SUPPLY IS 5.5 bara, 155 °C.
  3. MAXIMUM WATER CONTENT IN FINAL SALT CAKE IS 25% BY WEIGHT.
  4. DESIGN WET BULB TEMPERATURE IS 27 °C. DRY BULB TEMPERATURE IS 30 °C.
  5. DISTILLATE TOTAL SOLIDS (NON-VOLATILE) IS < 100 mg/kg PRIOR TO COOLING TOWER.
  6. GUARANTEED MAXIMUM STEAM CONSUMPTION IS 6.27 t/h.

	1	1a	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	Feed to plant	Spore	To BC Train 2	To BC Train 1	To BC Train 1 Preheat (1)	To BC Train 1 Preheat (2)	To BC Train 1 Preheat (2)	To BC Train 1 Preheat (2)	Feed to BC Train 1	Feed to BC Train 1	Distillate and BC Train 1	Hot Distillate to BC Train 1 Preheat (1)	BC Train 1 Distillate Tank Vent	BC Train 1 Evaporator Vent	BC Train 1 Vents to Deaerator	BC Train 1 Vents to Atmosphere	Spore	Spore	BC Train 1 Vapour to Compressor	Spore	BC Train 1 Vapour Discharge from Comp	BC Train 1 Total Vapour to Deauperheat	BC Train 1 Distillate to Deauperheat	BC Train 1 Total Vapour to Stillbids	BC Train 1 Circulation to Pump	BC Train 1 Circulation to Pump	
Continuous / Intermittent	Continuous		Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Flow kg/hr	37210		18605	18605	13362	13362	8243	8243	18605	18600	13763	12948	0	178	178	183			13125		13125	13125	815	13940	507330	499674	
Flow m <sup>3</sup> /hr	36.5		18.2	18.2	13.1	13.8	5.1	5.4	18.1	19.1	14.4	13.6											0.9		461	454	
Water kg/hr	35555		17778	17778	12768	12768	5010	5010	17778	17778	13763	12948	0	0	0	0			0		0	0	815	0	411084	406783	
Solids kg/hr	1647		822	822	590	590	232	232	822	822	0	0	0	0	0	0			0		0	0	0	0	93686	92891	
Uncondensables kg/hr	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0			0		0	0	0	0	0	0	
Steam/Water Vapour kg/hr	0		0	0	0	0	0	0	0	0	0	0	0	178	178	178			13125		13125	13125	0	13940	0	0	
TDS, ppm	44258		44171	44171	44171	44171	44171	44171	44171	44183	5	5	5	5	5	5			5		5	5	5	5	155923	155923	
TSS, ppm	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0			0		0	0	0	0	29980	29980	
Total Solids, weight percent	4.4		4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	0	0	0	0	0	0			0		0	0	0	0	18.5	18.6	
Temperature deg. C	40		40	40	40	40	96	40	96	101	108.1	108.1	108.1	108.1	108.1	108.1			101.1		130.3	130.3	108.1	108.1	104.7	104.7	
Pressure kPa(g)	375		375	375	375	300	375	300	300	50	32.8	375	32.8	32.8	32.8	32.8			4.1		32.8	32.8	375	32.8	30	150	
Specific Gravity	1.02		1.02	1.02	1.02	0.985	1.02	0.975	0.975	0.975	0.954	0.954											0.954		1.1	1.1	

**Fusina Brine Concentrator Design (Worst Case) Chemistry 100% Capacity**

- Notes:**
1. Seed Tank used only at startup.
  2. Steam make up valve normally shut, except at cold startup.

REV	1	20/08/05	WAS	DPB	WAS	FIRST ISSUE
REV	2	20/08/05	WAS	DPB	WAS	REVISIONE
REV	3	20/08/05	WAS	DPB	WAS	REVISIONE
REV	4	20/08/05	WAS	DPB	WAS	REVISIONE
REV	5	20/08/05	WAS	DPB	WAS	REVISIONE
REV	6	20/08/05	WAS	DPB	WAS	REVISIONE
REV	7	20/08/05	WAS	DPB	WAS	REVISIONE
REV	8	20/08/05	WAS	DPB	WAS	REVISIONE
REV	9	20/08/05	WAS	DPB	WAS	REVISIONE
REV	10	20/08/05	WAS	DPB	WAS	REVISIONE
REV	11	20/08/05	WAS	DPB	WAS	REVISIONE
REV	12	20/08/05	WAS	DPB	WAS	REVISIONE
REV	13	20/08/05	WAS	DPB	WAS	REVISIONE
REV	14	20/08/05	WAS	DPB	WAS	REVISIONE
REV	15	20/08/05	WAS	DPB	WAS	REVISIONE
REV	16	20/08/05	WAS	DPB	WAS	REVISIONE
REV	17	20/08/05	WAS	DPB	WAS	REVISIONE
REV	18	20/08/05	WAS	DPB	WAS	REVISIONE
REV	19	20/08/05	WAS	DPB	WAS	REVISIONE
REV	20	20/08/05	WAS	DPB	WAS	REVISIONE
REV	21	20/08/05	WAS	DPB	WAS	REVISIONE
REV	22	20/08/05	WAS	DPB	WAS	REVISIONE
REV	23	20/08/05	WAS	DPB	WAS	REVISIONE
REV	24	20/08/05	WAS	DPB	WAS	REVISIONE
REV	25	20/08/05	WAS	DPB	WAS	REVISIONE

**FUSINA**

**PROCESS FLOW DIAGRAM WITH MASS BALANCE EVAPORATOR-CRYSTALLIZER**

**P-30020-DT-AE-ICD001Fi-B**

**ASSOCIAZIONE TEMPORANEA DI IMPRESE**  
**TEMPORARY ASSOCIATION OF COMPANIES**

**AQUATECH INTERNATIONAL CORPORATION**

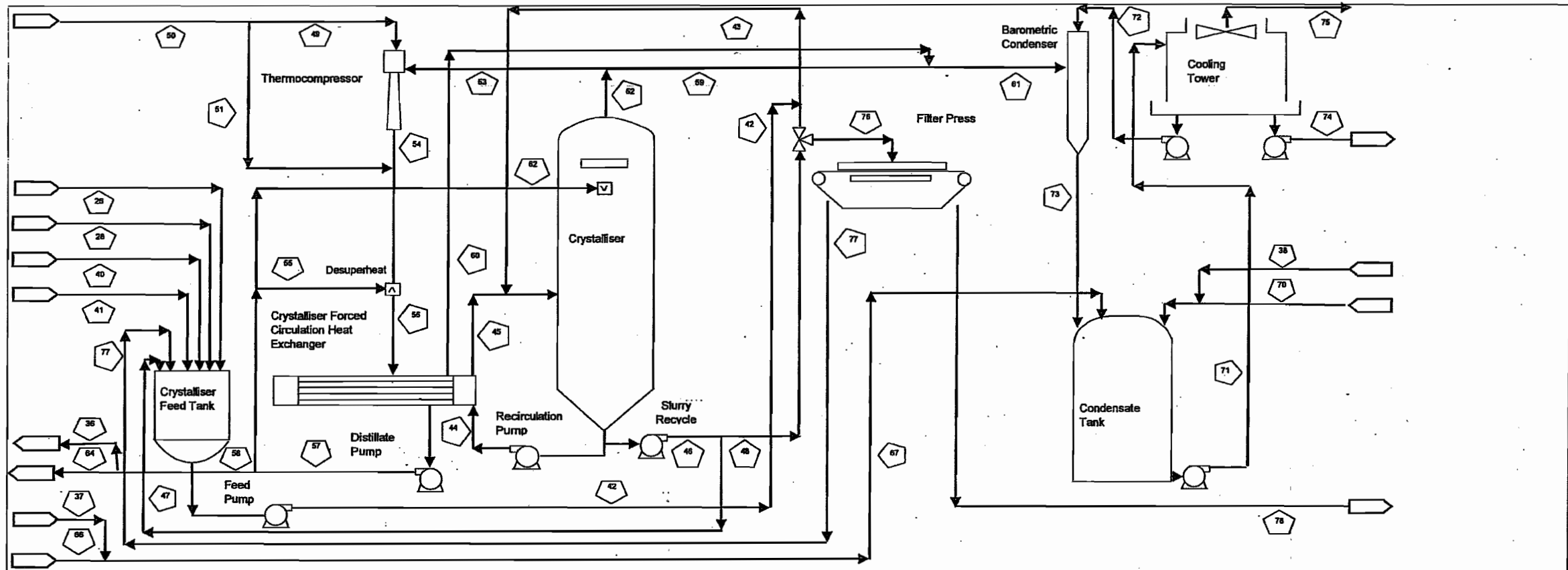
**CARLO GAVAZZI IMPIANTI SpA**

**Enel**

**PBFUAB5005**

**IMPIANTO TERMOELETTICO DI FUSINA**  
**Ambientalizzazione della sez. 1-2**

**Enel**



	26	40	28	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	
	Slurry from BC Train 1	Slurry from BC Train 2	From Train 1 Hydrocyclone	From Train 2 Hydrocyclone	Feed to Plant	Feed/Recirc to Crystalliser	Exit Recirc Pump	Exit Heat Exchanger	Slurry Recycle Pump Discharge	Crystalliser Dump to Feed Tank	Slurry Recycle to Filter Press or Flash Tank	Thermocompressor Motive Steam	Total Supply Steam	Thermocompressor steam bypass (Note 2)	Vapour exit Crystalliser	Vapour to Thermo-compressor	Vapour Exit Thermo-compressor	Desuper-heating water	Total Vapour to Heat Exchanger	Condensate exit Pump	Condensate to Preheat Exchangers	Vapour to Condenser	Vent	Total Vapour to Condenser	Wash Water	
Continuous / Intermittent	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Intermittent	Continuous	Continuous	Continuous	Start-up	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Intermittent	
Total Flow kg/hr	152	152	5096	5096	16530	40667	3911059	3911059	24137	0	24137	6294	6294	0	8302	2915	9210	312	9521	9346	9035	5386	175	5561	950	
Total Flow m3/hr	0.1	0.1	4.9	4.9	15.0	32.3	2794	2794	17.2	0	17.2	-	-	-	-	-	0.3	-	-	9346	9035	-	-	-	1	
Water kg/hr	124	124	4301	4301	12416	24484	1955529	1955529	12068	0	12068	0	0	0	0	0	0	312	0	9346	9035	0	0	0	950	
Solids kg/hr	28	28	795	795	4114	16183	1955529	1955529	12068	0	12068	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uncondensables kg/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steam/Vapour kg/hr	0	0	0	0	0	0	0	0	0	0	0	6294	6294	0	8302	2915	9210	0	9521	0	0	5386	175	5561	0	
TDS, ppm	155923	155923	155923	155923	208517	282814	300000	300000	300000	300000	300000	0	0	0	5	5	2	2	2	2	2	2	5	2	5	
TSS, ppm	29980	29980	0	0	57441	192926	285714	285714	285714	285714	285714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Solids, weight percent	18.6	18.6	15.6	15.6	24.9	39.6	50.0	50.0	50.0	50.0	50.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Temperature deg. C	104.7	104.7	104.7	104.7	108.1	111.7	114.1	116.1	114.1	114.1	114.1	155.4	155.4	155.4	100.6	100.6	166.1	119.4	119.4	119.4	119.4	100.6	119.4	100.6	119.4	
Pressure kPa(g)	50	50	100	100	200	200	100	0	100	100	100	448	448	448	4.2	4.2	94	94	94	200	200	4.2	94	4.2	125	
Specific Gravity	1.1	1.1	1.1	1.1	1.1	1.1	1.4	1.4	1.4	1.4	1.4	1	1	1	1	1	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	

	38	64	37	66	67	68	38	70	71	72	73	74	75	76	77	78	79	80	81	82	Fusina	
	Condensate to BC Train 1 PHX	Condensate to BC Train 2 PHX	Condensate from BC Train 1 PHX	Condensate from BC Train 2 PHX	Total Condensate from Preheaters	Spare	Distillate from Train 1 Feed-Distillate PHX	Distillate from Train 2 Feed-Distillate PHX	To Cooling Tower	Cooling Water to Barometric Condenser	Cooling Water to Barometric Condenser	Cooling Water Blowdown	Cooling Tower DTR and Evaporation	Slurry to Filter Press	Filter from Filter Press	Filter Cake to Discharge						Crystalliser
Continuous / Intermittent	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Intermittent / Time Averaged	Intermittent / Time Averaged	Intermittent / Time Averaged						Design (Worst Case) Chemistry
Total Flow kg/hr	4517	4517	4517	4517	9035		12948	12948	350026	309535	315096	33555	6936	8228	6034	2194						100% Capacity
Total Flow m3/hr	5	5	4.6	4.6	9		13	13	354	313	318	41	-	5.9	5.0	-						
Water kg/hr	4517	4517	4517	4517	9035		12948	12948	350026	309535	315096	33555	0	4114	3566	549						Note 1: Distillate purity: Boron less than 62.1 ppm
Solids kg/hr	0	0	0	0	0		0	0	0	0	0	0	0	4114	2469	1646						Note 2: When Feed Boron equals 185 ppm, during cold start-up only, the steam bypass flow is used for system heating.
Uncondensables kg/hr	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0						Note 3: See Doc. # PBFUA85630 (Chemistry Control) for more detailed calculation regarding chemistry composition variation for all streams.
Steam/Vapour kg/hr	0	0	0	0	0		0	0	0	0	0	0	6936	0	0	0						
TDS, ppm	2	2	2	2	2		5	5	4	4	4	4	4	300000	300000	300000						
TSS, ppm	0	0	0	0	0		0	0	0	0	0	0	0	285714	155844	642857						
Total Solids, weight percent	0	0	0	0	0		0	0	0	0	0	0	0	50.0	40.9	75.0						
Temperature	119.4	119.4	52	52	52		52	52	48	37	48	37	48	114.1	114.1	114.1						
Pressure	200	200	100	100	100		275	275	100	100	0	200	0	100	0	0						
Specific Gravity	0.95	0.95	0.99	0.99	0.99		0.99	0.99	0.99	0.99	0.99	1	1	1.4	1.2	-						

ARE THESE CORRECT?

→ 7h max.?

→ 3h max. No. 3?

↑

IF NO, WHY?

REV.	DATE	PREP.
8	15MAY07	GJM
7	20DEC06	GJM
6	05OCT06	GJM

DIVISIONE GEM/SRI

NOME FILE: PBFUA85005-08.PDF

PROGETTO : IMPIANTO TERMOELETTRICO DI FUSINA  
 Ambientalizzazione delle sezz. 1-2

TITOLO: FUSINA  
 Title: PROCESS FLOW DIAGRAM WITH MASS BALANCE  
 EVAPORATOR-CRYSTALLIZER

DIS.N. PBFUA85005

FOGLIO 2

SEGUE FG. 2

MANDATARIA LEADER

CARLO GAVAZZI IMPIANTI SpA

MANDANTE PARTNER

REV.	3
	4
	5
	6
	7
	8

DISEGNO N./Drawing N. P-30020-DW-AE-ICD001F1-H

FOGLIO 2 Sheet 2

SEGUE Cont.on 2