Realization 2 MW PEM PP project Ynnovate and EU

Jan ten Have

October 2016

Project partners

Realisation project partners

- Ynnovate (CN) - Principal, utilities, operation of the system
- Nedstack (NL) - Development and realization of the fuel cells (stacks)
- MTSA (NL) - Design and construction of the installation (excluding fuel cells), project management realization
- AkzoNobel (NL and China) – contract, project support

Project partners

Development project, financially supported by the European Union

Development project partners EU project

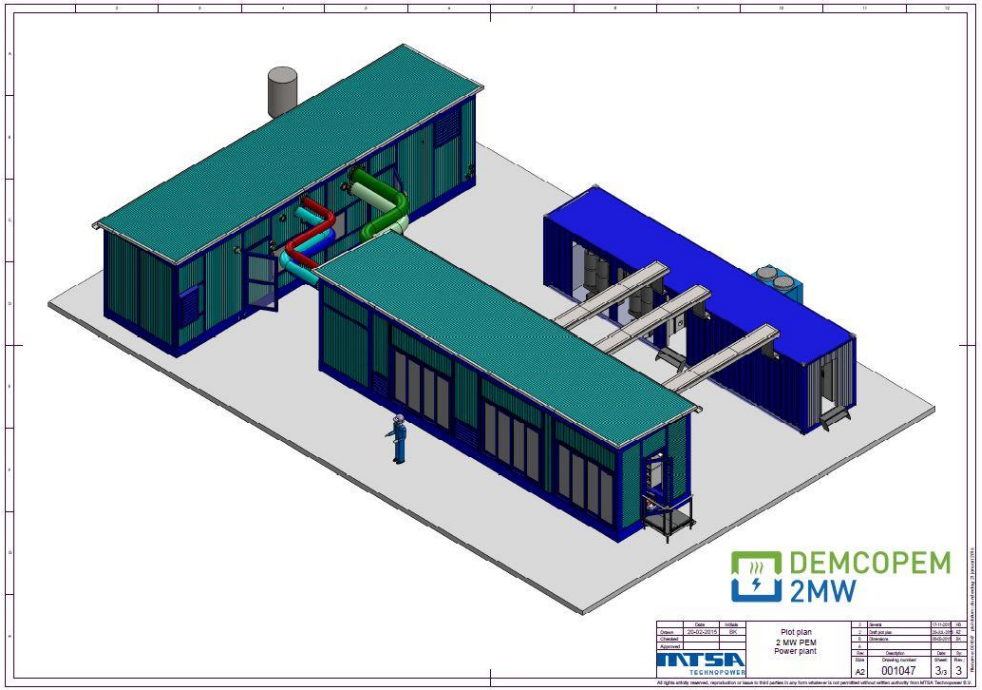
- AkzoNobel (NL) - Project management
- Nedstack (NL) – Stack development
- MTSA Technopower - Balance of Plant development
- Johnson Matthey (UK) – Optimized MEA production development
- Polimi (I) - Process model development

Project acronym: DEMCOPEM
http://www.demcopem-2mw.eu/

This project is co-funded by the 7th FP (Seventh Framework Programme) – Fuel Cells and Hydrogen Joint Undertaking

Project description

- Production of electricity
- Specification 2 MW-e
- Use hydrogen as energy source
- Hydrogen is a by-product of production
- Integration in existing production facility
- Use of produced thermal energy
- By-product water to be used



Ynnovate site in Yingkou (Province Liaoning, China)

MTSA Technopower

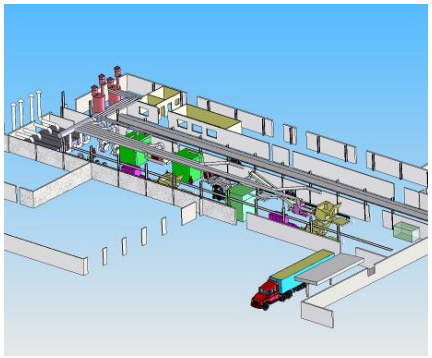
MTSA Technopower designs, builds and maintains customer specific equipment, installations and machines

History

- 1994: Establishment MTSA Technopower from Shell Industrial Services
- 2003: Acquisition KEMA Techniek
- 2004: Incorporation of expertise and personnel AkzoNobel RST department
- Autonomous Growth

Lines of Business

Projects



Equipment
Installations
Pilot plants
Production plants
Machines
Test & measuring equipment

Products

High power equipment
Borescope
Mist fire extinguishing system: Coolcloud®

Supply

System supply
Parts
Modules
Co-design
Supply chain management

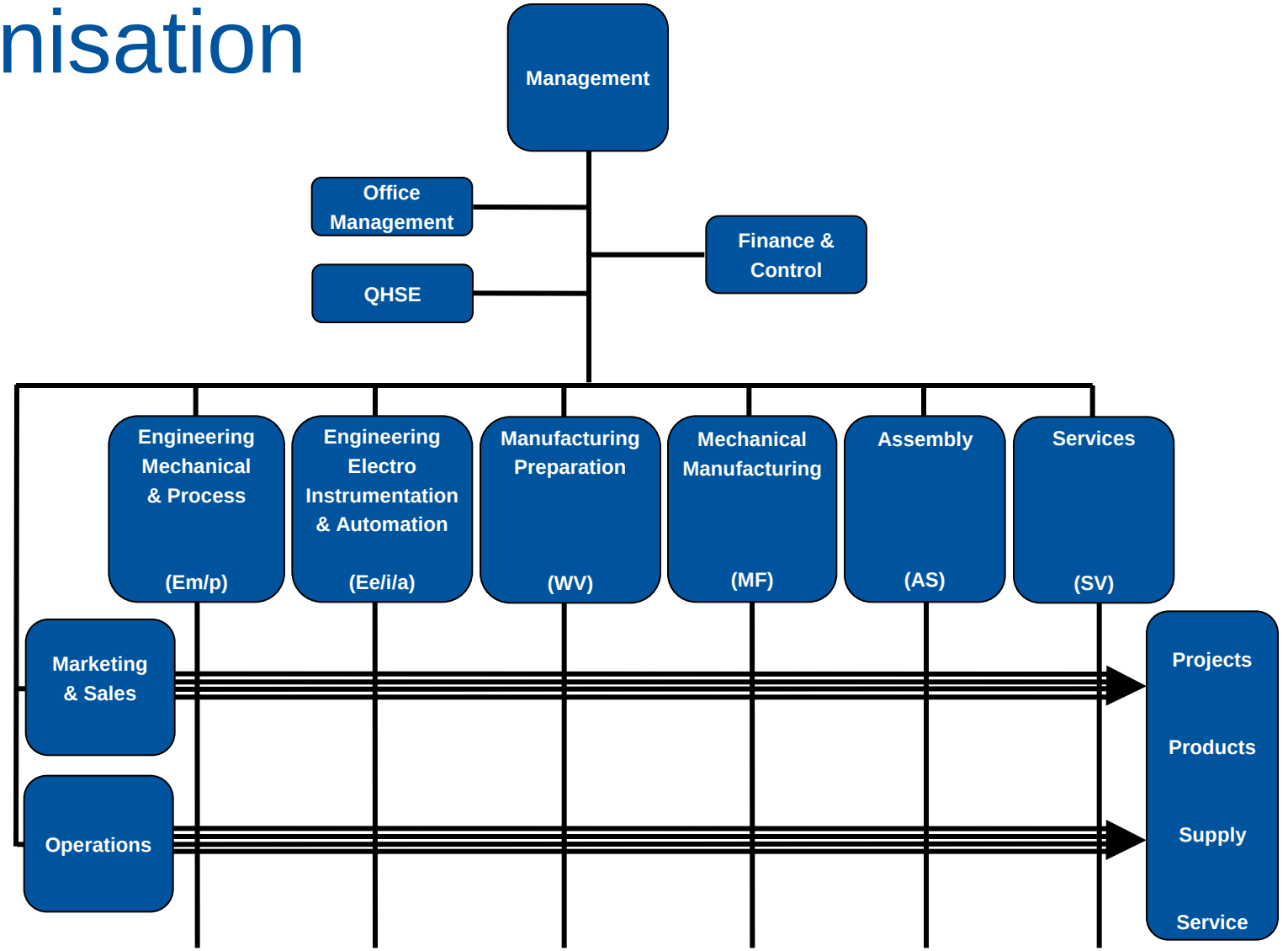
Service

Maintenance
(Dis)assembly
Renovation
Installation
System integration
Fault clearing service

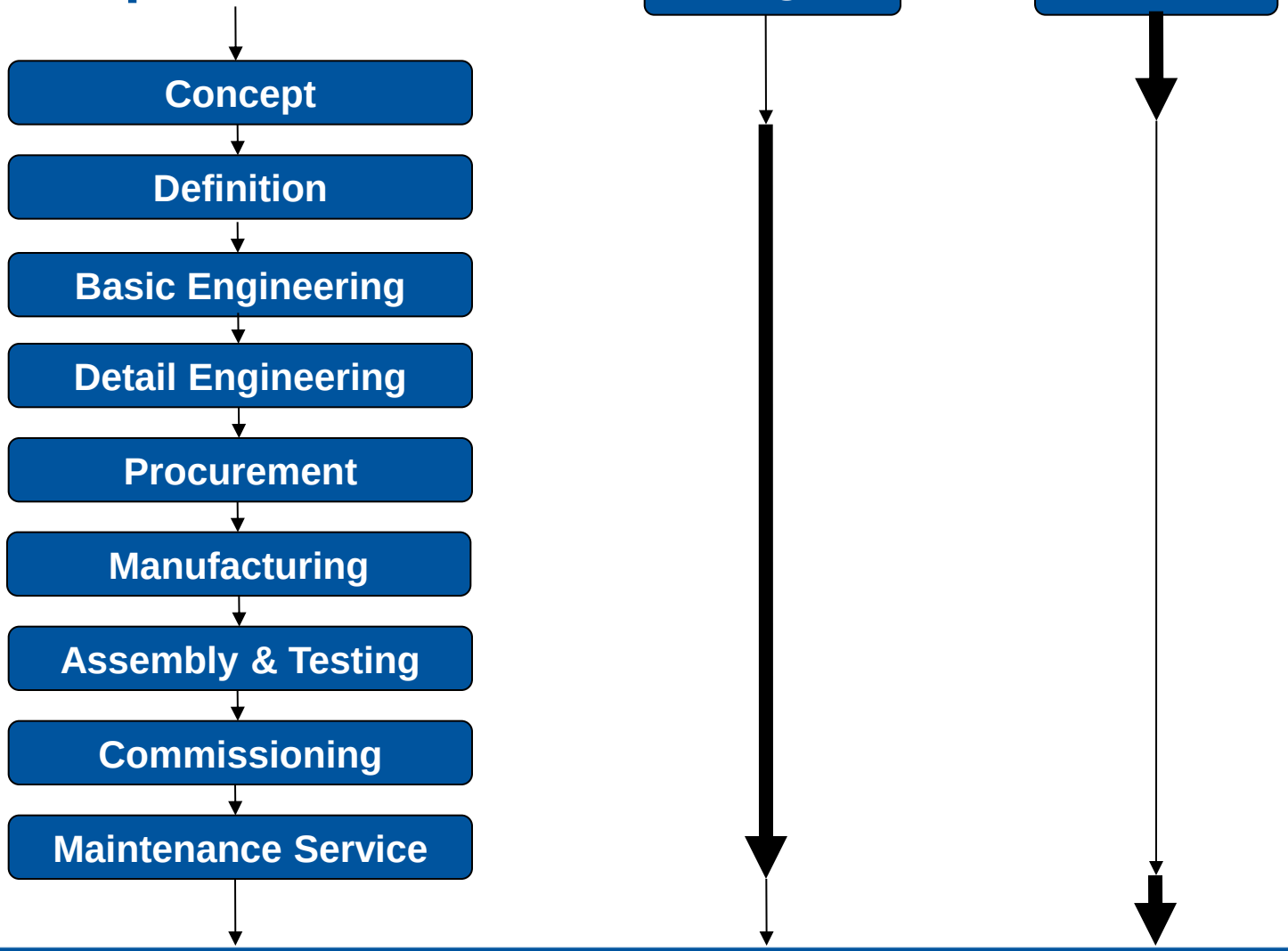
Markets

Energy	Process	Food	Pharma	Mechatronics	R&D
					
Oil & Gas High Power Nuclear energy Solar energy Fuel cell systems Biomass	Chemistry Metallurgy Graphic Polymers Industrial yarns	Food	Pharma	Medical Semi conductors Analytical Special machines	R&D

Organisation



Project phases



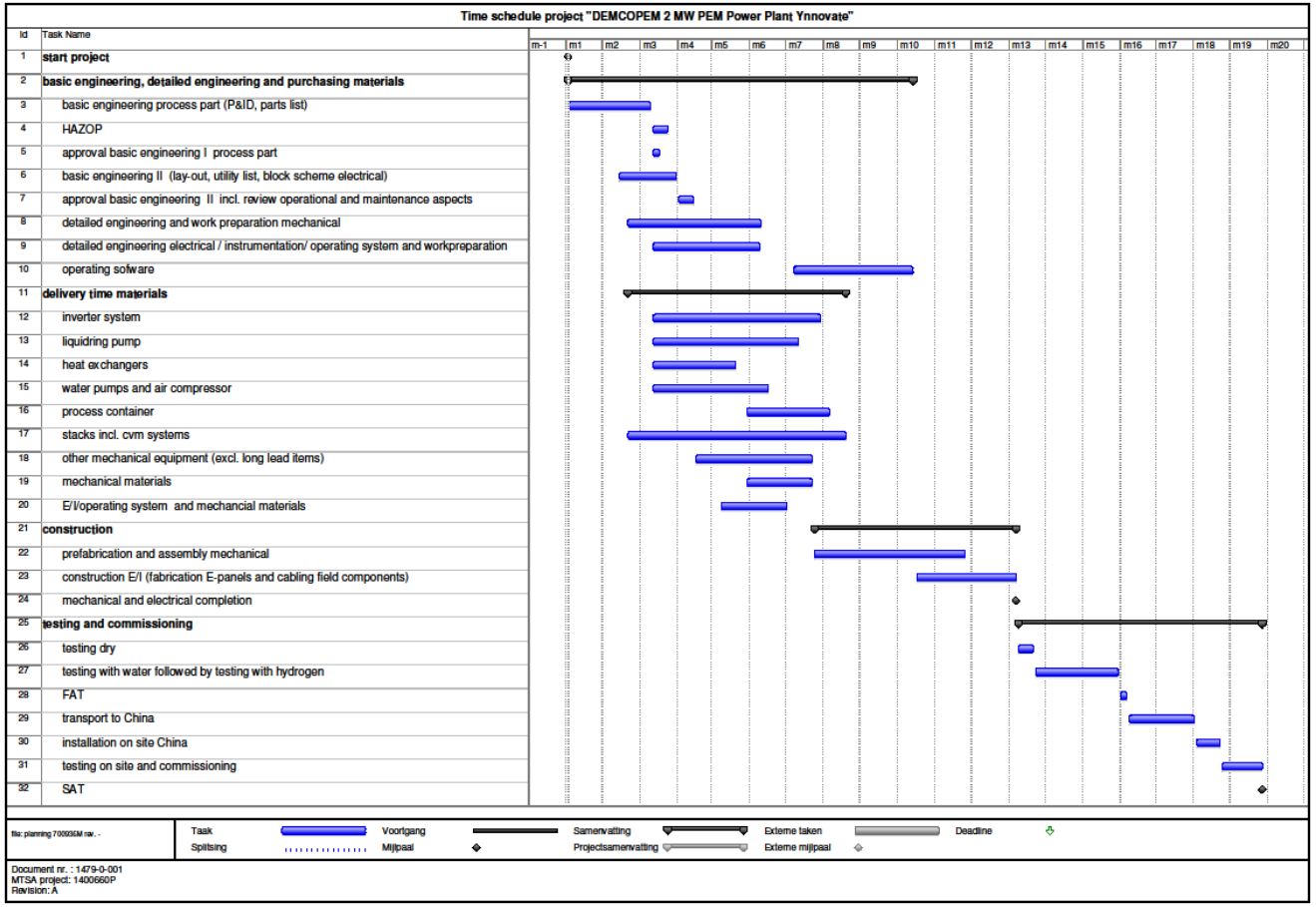
References

- Many reputable companies and government institutions have meanwhile employed services from MTSA Technopower
- Approximately 60% of sales is being exported
- Customer satisfaction is high, resulting in long-term relationships
- New customers often reach us via satisfied references
- Experienced in fuel cell projects

Contract signing

Start date 1-1-2015

Time Schedule



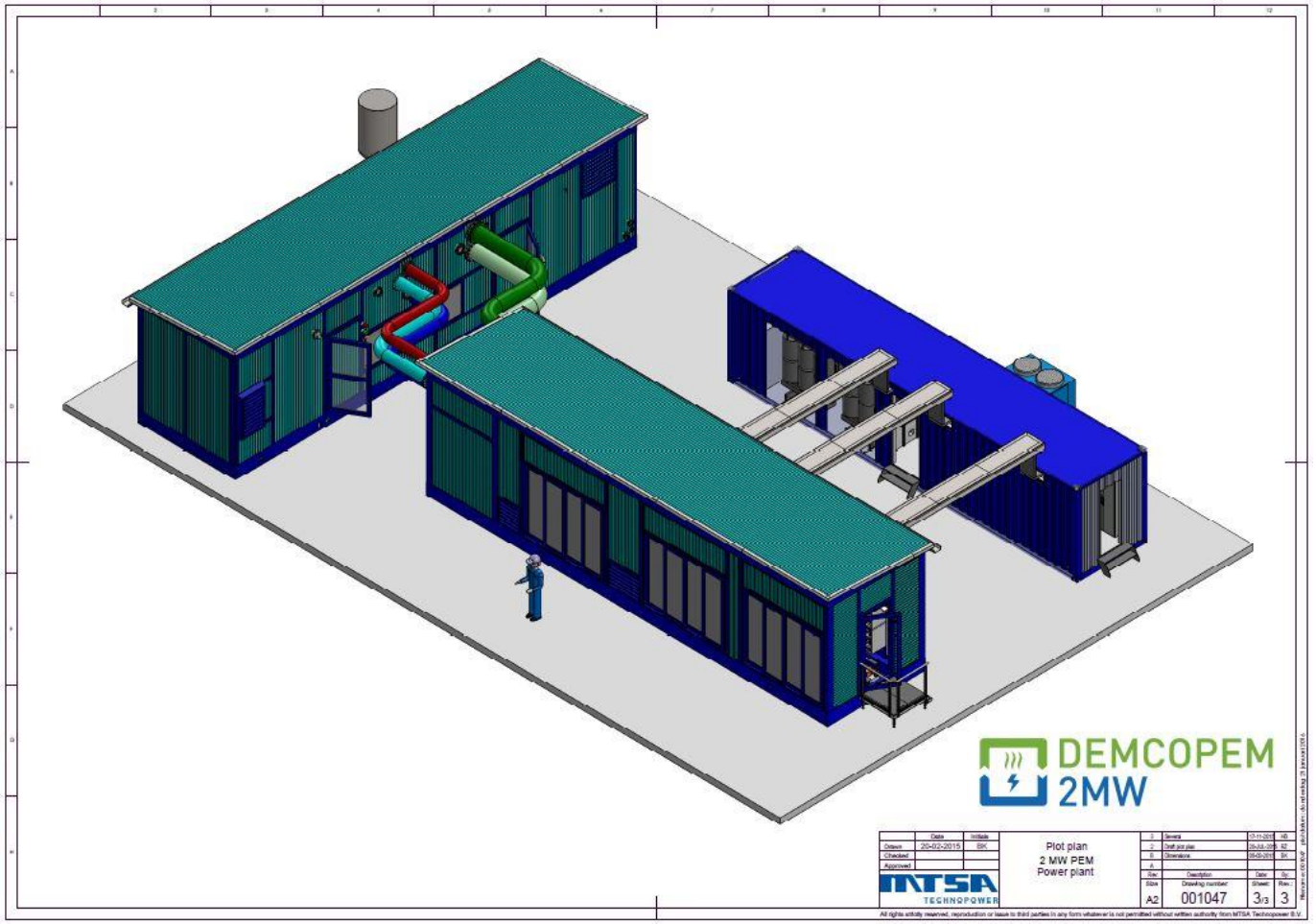
MTSA: Overview activities

Design
- Process
- Mechanical
- Electrical
- Software
- Safety

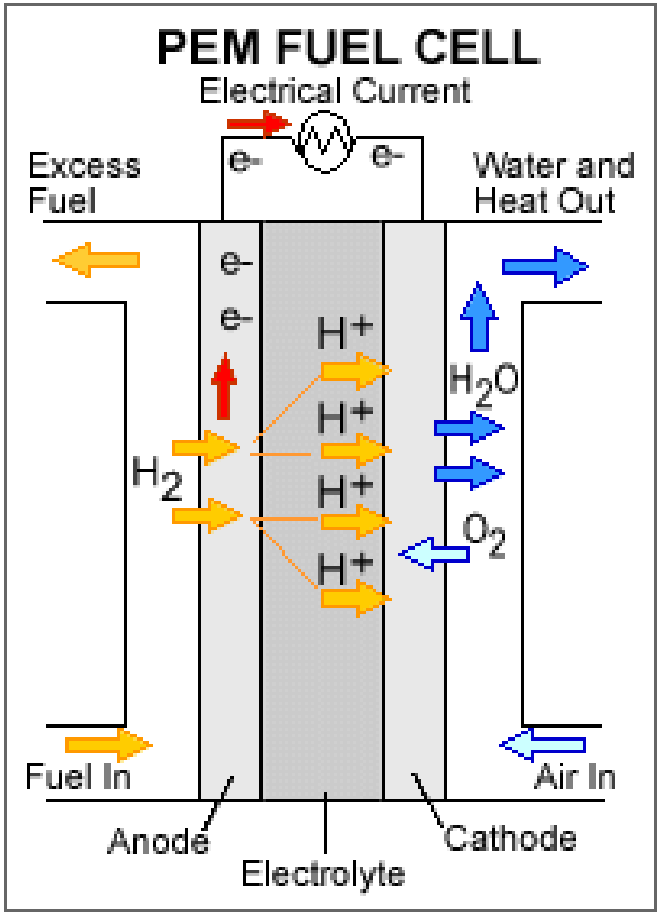
Construction
- Mechanical
- Electrical

Testing and commissioning
- Tests at MTSA
- Factory Acceptance Test
- Test at Ynnovate
- Site Acceptance Test

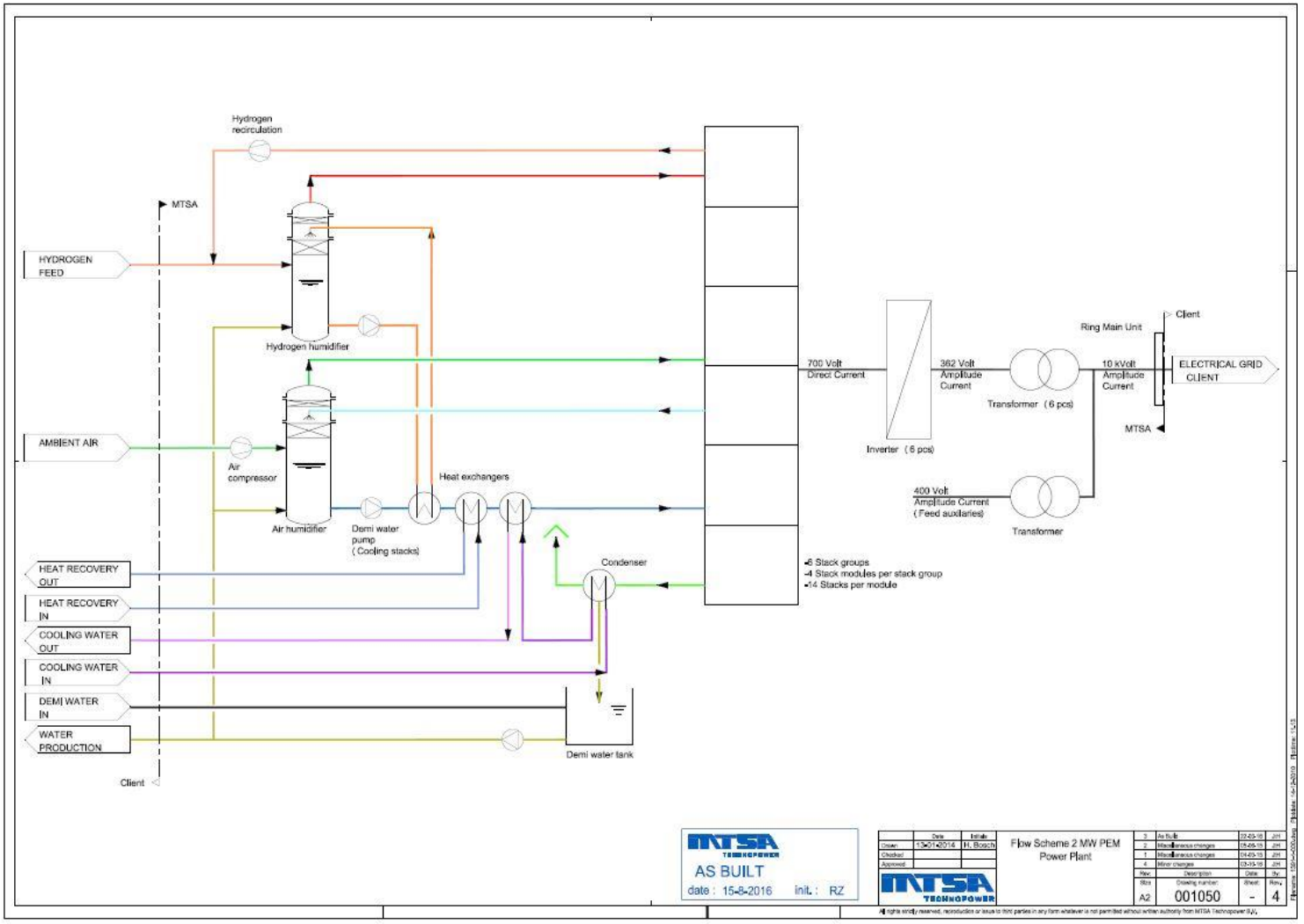
Lay-out


DEMCOPEM
2MW
Plot plan
2 MW PEM
Power plant
MTSA TECHNOPOWER
001047

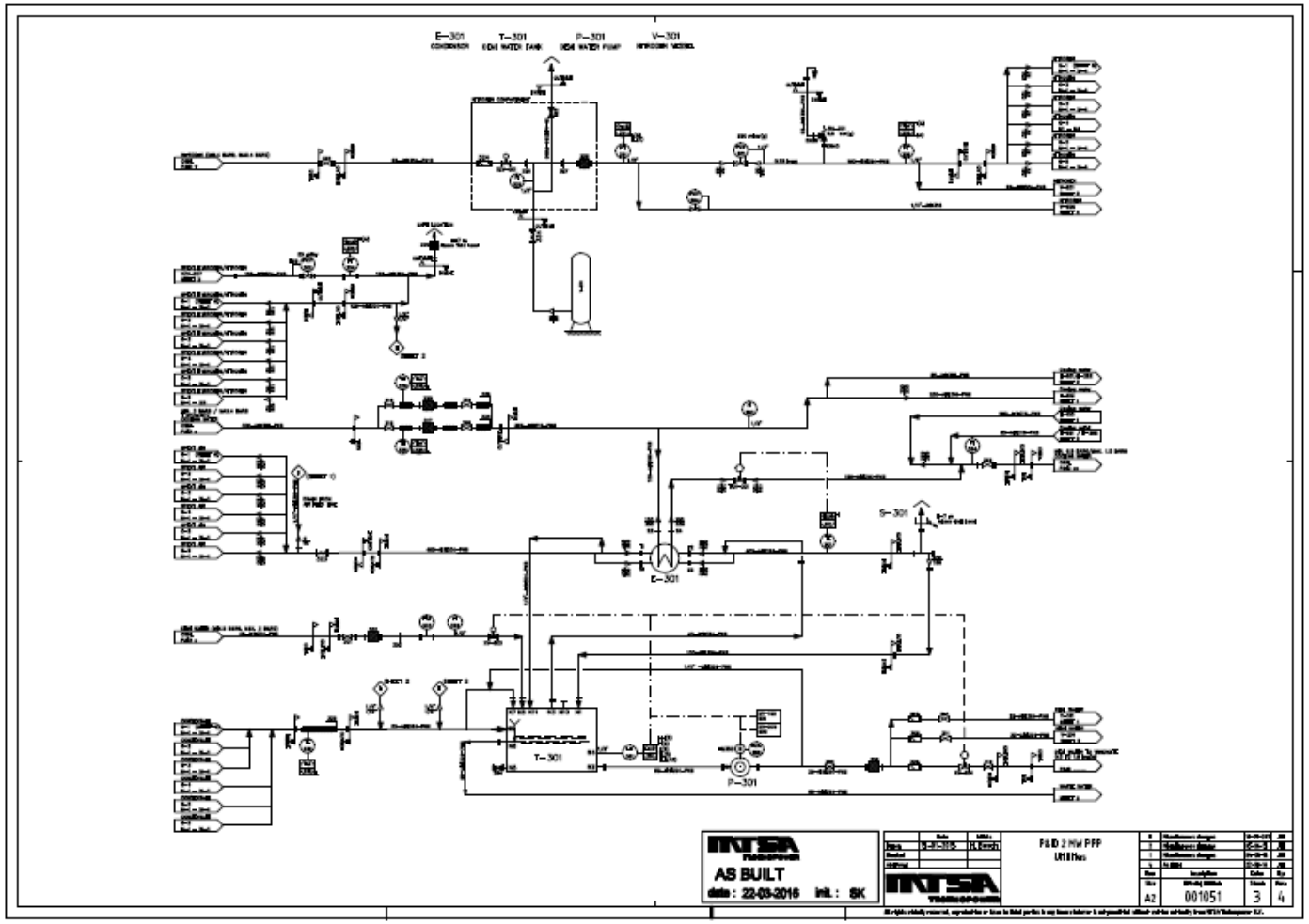
Stack schematic



Principle flowscheme



P & ID Example


E-301
T-301
P-301
V-301
AS BUILT
date : 22-03-2016 init. : SK
P&ID 2 MW PEM
001051

Specification of main parts

MTSA TECHNOPOWER

Parts list

Project name:	2 MW PEM Power plant	Doc. nr.:	**001312**	
Client:	Ynnovate and EU	Rev.:	**B 05-06-2015**	
Type nr.:	1479	Related documents:	001051	
Project nr.:	1400660P			
By:	JtH			
Date:	28-jan-15 (first Issue)	Status:	**DRAFT**	
Remark:	Applicable is ATEX 3 G T1 for electrical parts in the process compartment except for the stacks.			
Remark:	For all items a technical equivalent make or type als alternative can be selected by MTSA.			

Rev.	Tag nr.	Description	Type	Medium	Max.op. temp. °C	Max. op. pressure barg	Min./max. capacity	Material	Remarks
Equipment									
	E-101	cooler	plate heat exchanger	desti water / desti water	70	6	hot side 350 m3/h; cold side 60 m3/h	AISI-316 / NBR	
	E-102	heater	plate heat exchanger	desti water / demin water	70	6	hot side 350 m3/h; cold side 85 m3/h	AISI-316 / NBR	
	E-103	heater	plate heat exchanger	cooling water / desti water	70	6	hot side 350 m3/h; cold side 140 m3/h	AISI-316 / NBR	
	E-201	cooler	plate heat exchanger	cooling water / desti water	70	6	hot side 2.5 m3/h; cold side 3 m3/h	AISI-316 / NBR	
	E-202	cooler	plate heat exchanger	cooling water / desti water	70	6	hot side 60 m3/h; cold side 35 m3/h	AISI-316 / NBR	
	E-301	condensor	plate heat exchanger	air / cooling water	70	0.1	0 / 9,000 m3/h with water saturarized air / appr. 90 m3/h cooling water	AISI-316 / EPDM	
	E-302	heater	electric	air	183	na	appr. 35 kW	Incoloy heating element / AISI-316 housing	
	E-305	heater	electric	air	183	na	appr. 35 kW	Incoloy heating element / AISI-316 housing	
	E-310	heating / cooling / ventilation operating compartment	window airco	air		na	TBD		
	E-362	heater	electric	air	183	na	appr. 35 kW	Incoloy heating element / AISI-316 housing	
	E-365	heater	electric	air	183	na	appr. 35 kW	Incoloy heating element / AISI-316 housing	
B	E-380	heater / ventilation inverter compartment nverter container		air		na	TBD		
B	E-390	heater / ventilation transformer compartment Inverter container		air		na	TBD		1 x 230 V; including thermostat; Not ATEX (operating room)
	E-401	cooler	fluid / air	prim. (inverters) water-glycol; sec. air	50		0 / 30 kW (Hold)		
B	E-402	cooler	fluid / air	prim. (inverters) water-glycol; sec. air	50		0 / 30 kW (Hold)		
B	E/I-405	transformer					400 kVA		
	E/I-410	inverter					0 - 340 kVA		4 mA = 0 kW; 20 mA = 350 kW
	E/I-420	inverter					0 - 340 kVA		4 mA = 0 kW; 20 mA = 350 kW
	E/I-430	inverter					0 - 340 kVA		4 mA = 0 kW; 20 mA = 350 kW

OSBL specifications / utilities

MTSA TECHNOPOWER

Utility list

Project name:	2 MW PEM Power plant	Doc. nr.:			**Ynnovate**
Client:	Ynnovate	**Rev.:**	**E**		
ID. nr.:		Related documents:	P &ID 1479-1-001		
Project nr.:	1400660P				
By:	J.H. ten Have				
Date first issue:	21-6-2013	Status:	**DRAFT**		
Remark:					

Rev.	Description	Min. / Norm. / Max. Cap.	Unit	Min. / Norm. / Max. Temperature (C)	Min. / Norm. / Max. Pressure (barg)	Quality / Specification	Dimensions / Connections	Remarks
D	hydrogen	0 / 1,300 / 1,440	Nm3/h	appr. 30	0.4 / 0.6 / 0.7	Free of condensate. For further specification please see specification from Nedstack dated 11-9-2013; To be discussed between client and Nedstack.	To be defined	Hydrogen will be saturated with water; pressure variations smaller than 0.05 bar / min (to be discussed between client and MTSA)
D	ambient air					For specifications see specification from Nedstack dated 11-9-2013; To be discussed between client and Nedstack.		If possible installation to be placed at position on the site with the most clean ambient air (NO2 / SO2)
D	nitrogen	0 / 0 / 500	Nm3/h	amb.	4 / 4 / 4	minimal technical grade 2,5 ; no sulphur and halogens	To be defined	
	instrument air	0 / 0 / 50	Nm3/h	amb.	6 / 6/ 8	dew point < = 20 C; oilfree, dust free, free of particles	To be defined	
D	cooling water in	0 / 100 / 160	m3/h	15 / 20 / 25	3.0 / 3.0 / 3.0	appr. 2000 microS/cm; not fouling in plate heat exchangers	To be defined	
D	cooling water out	1 / 100 / 160	m3/h	25 / 30 / 35	1,5 / 1,5 / 1,5	appr. 2000 microS/cm; not fouling in plate heat exchangers	To be defined	
	desti water supply	0 / 0 / 5	m3/h	amb. (max. 20 C)	3 / 5 / 6	< 5 microS/cm	To be defined	
	heat recovery water in	12 / 20 / 30	m3/h	amb. (max. 20 C)	3 / 5 / 6	appr. 2000 microS/cm; not fouling in plate heat exchangers	To be defined	Example only. Total available approximately 1 MW at max. 55 C; Temperature difference between in - out minimally approximately 15 K ; Final opportunities for heat recovery to be defined in basic design phase. Lower or higher temperatures than defined to be agreed with with MTSA.
	heat recovery water out	12 / 20 / 30	m3/h	10 / 55 / 85	2.5 / 2.5 / 6	appr. 2,000 microS/cm; not fouling in plate heat exchangers	To be defined	
	water production	0 / 1 / 2,5	m3/h	10 / 55 / 85	0.5 / 1.0/ 1.5	demin water quality	To be defined	
D	drain	0 / 1 / 450	m3/h	65 / 65 / 70	atmospheric	demin water	To be defined	maximum capacity in emergency case only (relief provision)
	electrical connection (production)	-0.4 / 2.0 / 2.0	MW			3 phases, 10.1 kVrms +/- 5 %, 50 Hz +/- 0.2 Hz + 0 + power earth	To be defined	Power quality according to Utility Network Harmonics GB/T 14549-1993 or equivalent. Contribution of the 2 MW PEM Power plant to the short circuit power : 1.2 x P-max. ; Set up to be discussed between client and MTSA.
	earthing						M12 process containers; M12 electrical container	
	I / O's					Profibus (Siemens)		
	LAN connection							
	Site alarm to MW PPP							acoustic alarm will be delivered and installed by client, pending local legislation / demands. Advised by MTSA.
	Smoke detection							smoke detection will be delivered and installed by client pending local legislation / demands. Advised by MTSA.
D	Foot print installation							1 pc 40 ft high cube ISO container (weight appr. 20 mT); 2 pcs process containers (weight appr. 30 mT each). Dimensions per containers = approximately 12.0 x 3.0 x 4.0 m (L x W x H) ; One container (with stracks) to bep placed on (concrete) platform with height of 1 m ; distance between containers appr. 4 meter. Total estimated area 20 x 30 m. Lay-out to be defined in basic engineering phase.
D	General item number 1 : Elevation above sea level					approximately at sea level		
D	General item number 2 : Ambient conditions					minimum temperature - 25 C ; maximum temperature 40 C		

OSBL specifications / utilities

OSBL specifications / utilities

HAZOP Study

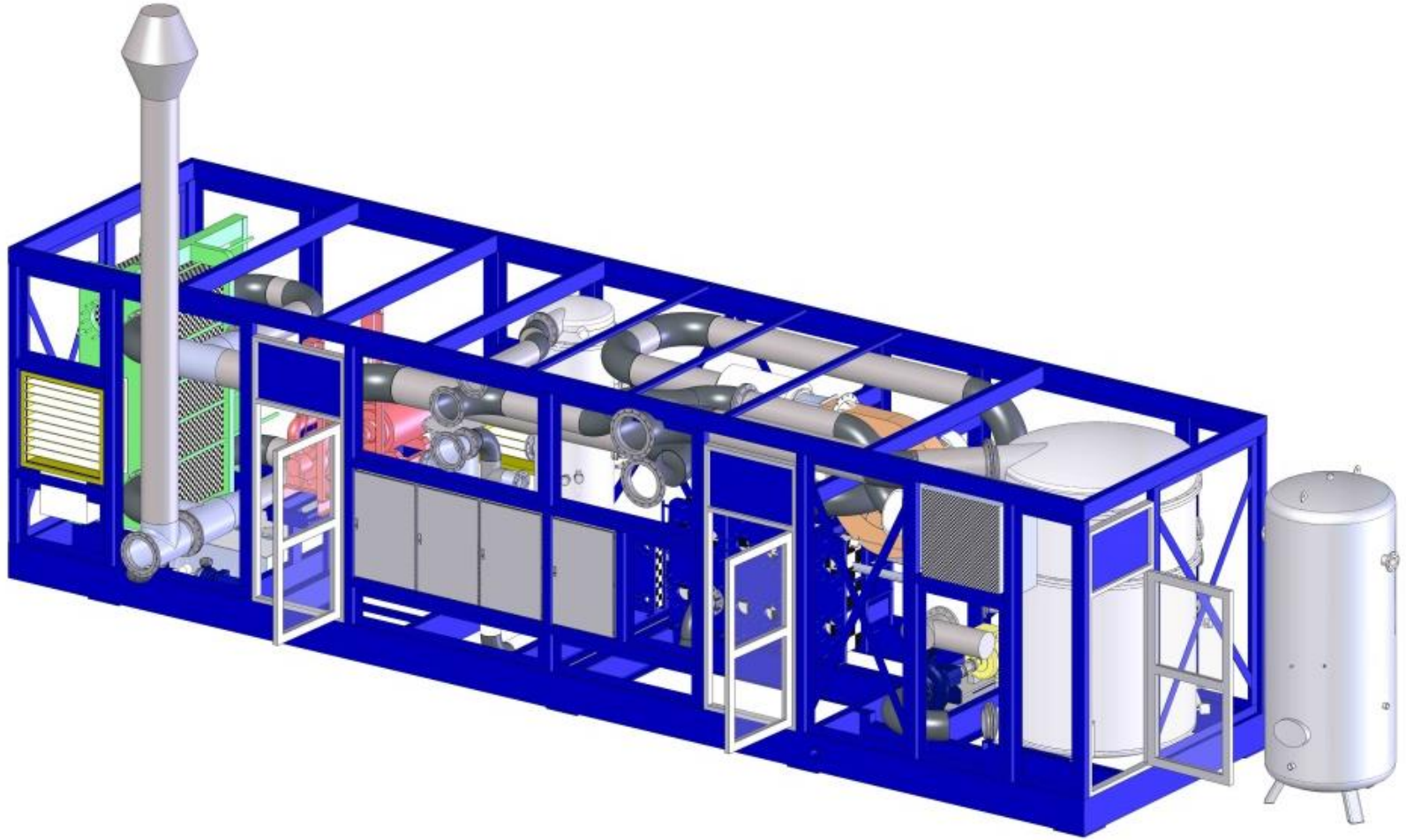
Hazard And Operability Study

Attendance of Designers and users

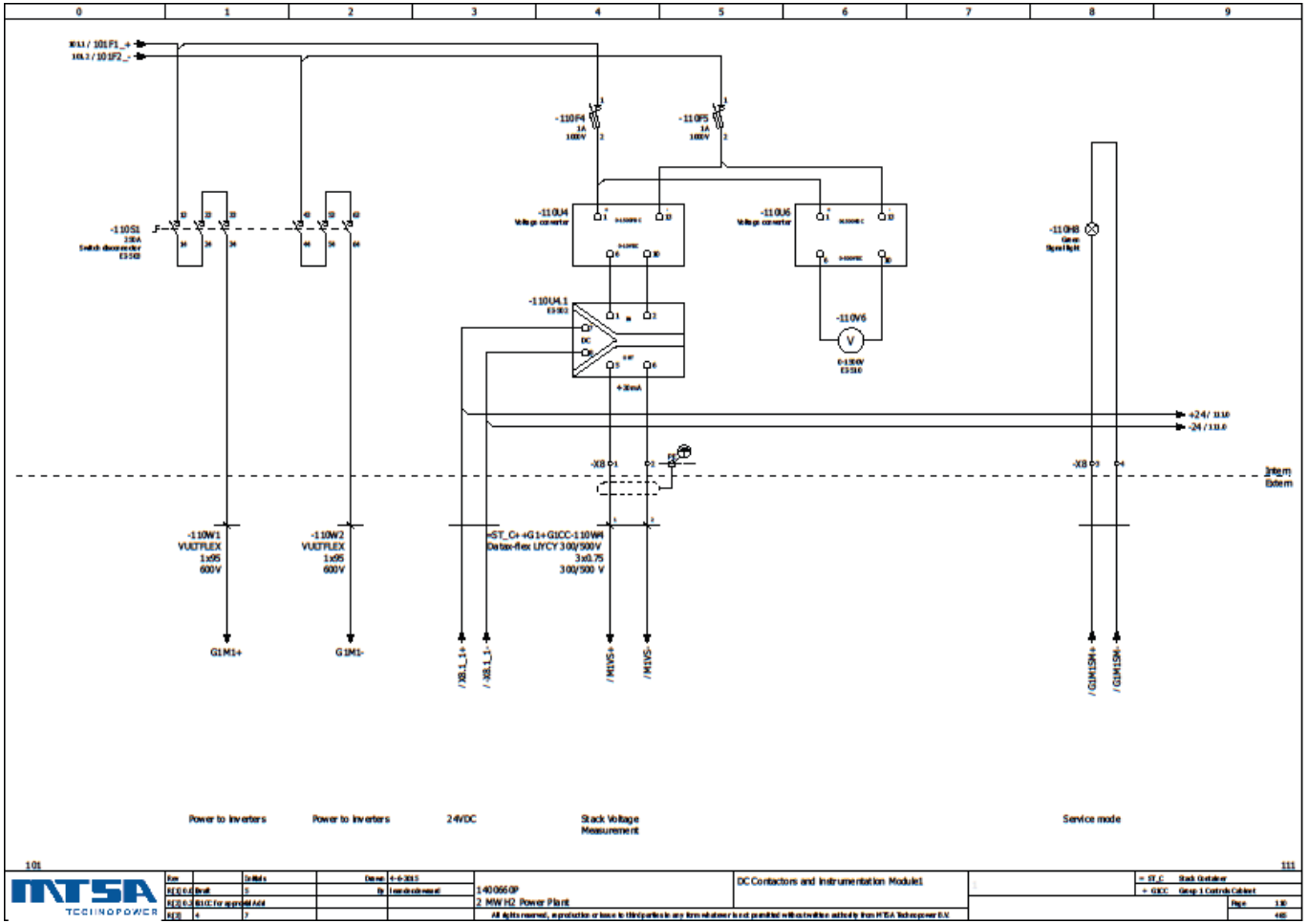
Parameter	Guideword	Deviation
FLOW	None, Less, More, Reverse Other, Also	No flow, Less flow, More flow, Reverse flow, Other flow, Contamination
PRESSURE	More Less	More pressure Less pressure
TEMPERATURE	More Less	Higher temperature Lower temperature
VISCOSITY	More Less	More viscosity Less viscosity
REACTION	None Less More	No reaction Reaction incomplete Intense reaction

Source: AUTHORS, based upon Chemical Industries Association

Mechanical design
Assembly drawing Process container



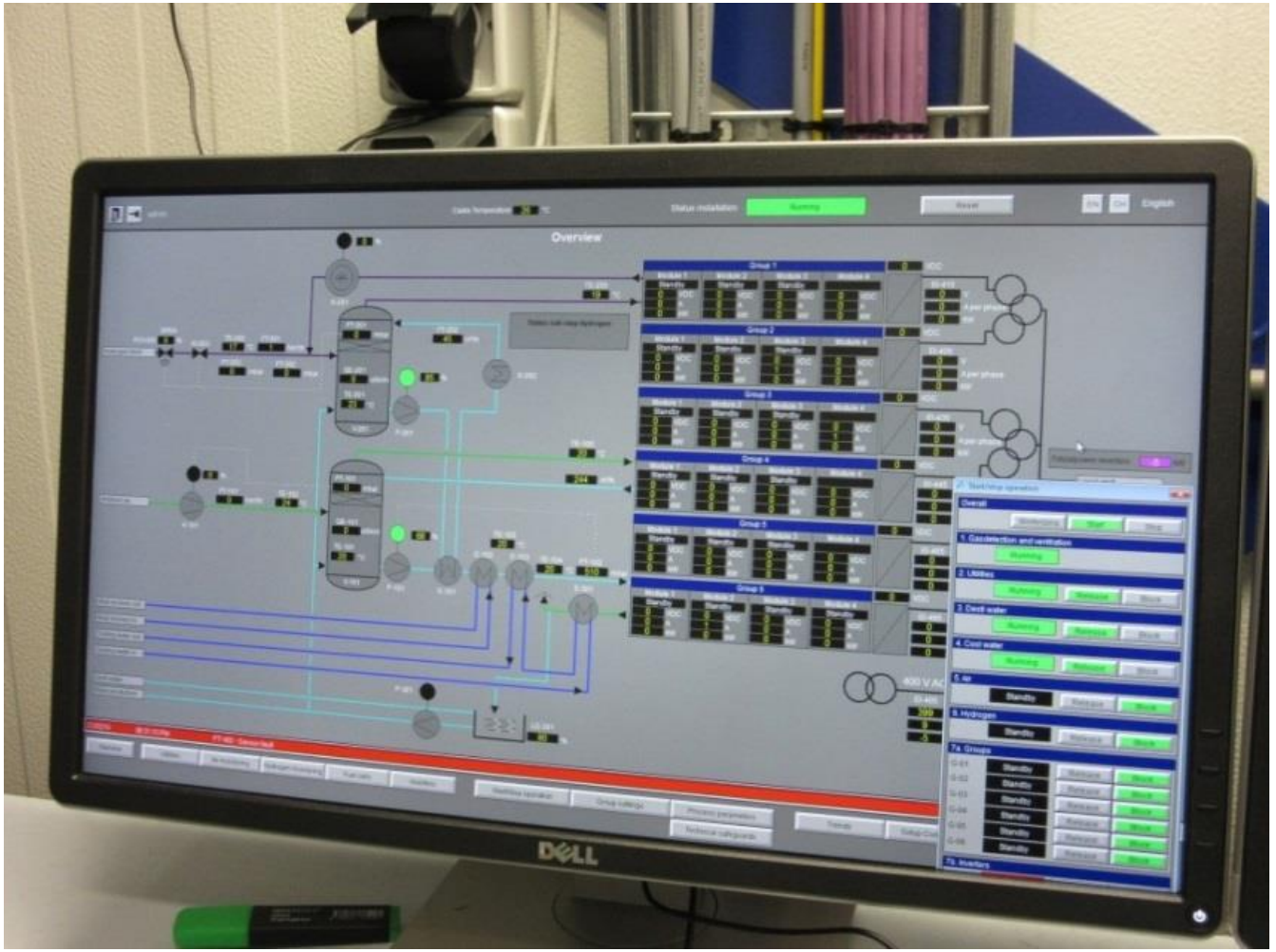
Electrical design



Construction at MTSA

Construction at MTSA

Operating system



Construction utilities at Ynnovate

Testing at MTSA

Testing at MTSA

Instruction and FAT at MTSA

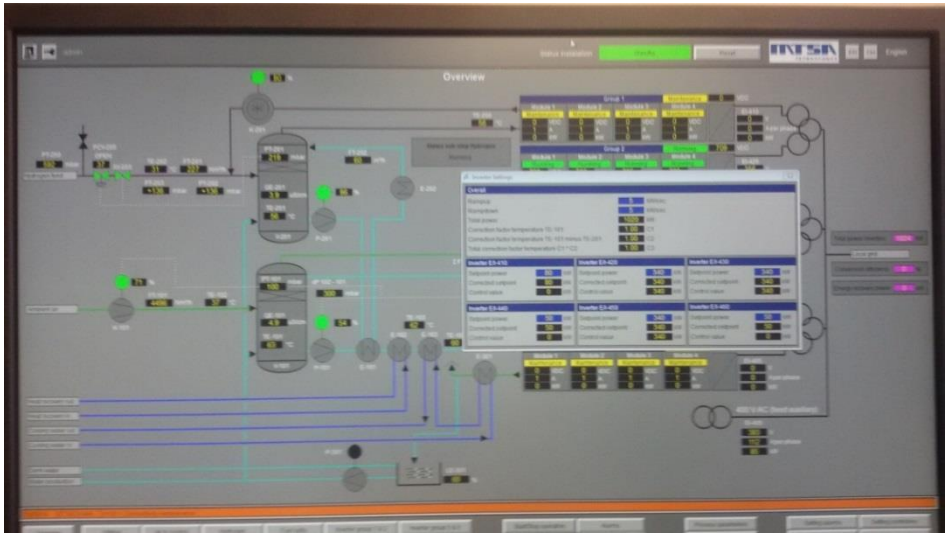
Transport to site

Ynnovate, Yingkou province Liaoning

Utilities connection

Commissioning and start-up, SAT

Commissioning and start-up, SAT



Thank you for your attention !

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