

Project No.	7G02
Contractor Doc No.	PMT-7G02-00-04-001-SPE
Change No.	0
Revision No.	B
Page	1 / 19

Project Design Basis

B	2024.03.30	Issued for Review	Geng Y.C Li. Z.J Zhang D.Y.	Xu H.	Wang L.		
A	2023.10.20	Issued for Review	Geng Y.C Li. Z.J	Xu H.	Wang L.		
Rev	Date	Purpose	ORIG. By	CHK'D By	APP'D By	F. APP'D By	Owner
Unit		Offsite & Utilities			Unit/Sub-unit Code		00
Sub-unit		General			Project Stage		Detail Engineering

INDEX

1 DESCRIPTION OF THE FACILITY CONTENT	4
1.1 Abbreviations and acronyms	5
1.2 Facility Content, Plant Types	5
1.2.1 Sulfuric acid plant (SAP-7G16)	6
1.2.2 Start up boiler (7G16-78)	6
1.2.3 Air Compression Station (7G02-14)	7
1.2.4 Liquid Nitrogen Station (7G02-77)	8
1.2.5 H ₂ SO ₄ Loading Hoses (7G02-90)	8
1.2.6 H ₂ SO ₄ loading storage unit (7G02-69)	9
1.2.7 Natural gas distribution station (7G02-98)	9
1.2.8 Cooling water station for SAP plant (7G16-71)	9
1.2.9 Demineralized and Industrial Water Station (7G02-72)	10
1.2.10 Fire water pump station (7G02-76)	10
1.2.11 Waste water treatment (7G02-75)	10
1.2.12 Drainage basin (7G02-80)	10
1.3 Life Time	10
1.4 Working shifts	10
1.5 Codes and measure systems	10
2 SITE CONDITIONS	11
2.1 Environmental data	11
2.1.1 Ambient Air temperature	11
2.1.2 Air barometric pressure	11
2.1.3 Relative humidity	11
2.1.4 Rain	11
2.1.5 Wind	11
2.1.6 Earthquake	12
2.1.7 Snow load and freezing depth:	12
2.1.8 Soil characteristics:	12
2.1.9 Minimum Metal Design Temperature (MDMT)	12
2.2 Location of Mining Complex	13
2.3 Identification of pick-up / delivery	13
2.4 Materials Handling	13
3 RAW MATERIALS	13
4 PRODUCTS SPECIFICATION	14
5 UTILITIES AVAILABLE	14
5.1 Electrical Power supply	14
5.2 Industrial water	15
5.3 Potable Water	16
5.4 Cooling Water	16
5.5 Natural gas as fuel	16
5.6 Instrument and Plant Air	18
5.7 Steam	18
5.8 PRODUCT USAGE SPECIFICATION	18

6 EFFLUENT EMISSION LIMITS	18
6.1 Emission to the Atmosphere	18
6.2 Waste Water	19
6.3 Solids Wastes	19

1 DESCRIPTION OF THE FACILITY CONTENT

This document summarizes the design basis for Sulfuric Acid Plant of the Chemical Complex to be installed in Janatas, Republic of Kazakhstan. The Project Site is located approx. 25 km west of Zhanatas. This chemical complex will comprise process units and utilities as defined in the following paragraphs, and includes a set of interconnected productions:

Number	Production unit
7G16	Sulfuric Acid Plant (SAP)
7G02	Offsite & Utilities (O&U)

This project will comprise process units and utilities as defined in the following table.

Plant No.	Unit/Sub-unit No.	Unit/Sub-unit name	Remark
7G16	20	SAP plant	Fast Track for SAP
7G16	21	Melting, filtration and supply of sulfur	Fast Track for SAP
7G16	22	Sulfur combustion, SO ₂ /SO ₃ conversion	Fast Track for SAP
7G16	23	Air drying, SO ₃ absorption	Fast Track for SAP
7G16	24	Heat recovery system	Fast Track for SAP
7G16	25	Sulfuric acid storage unit	Fast Track for SAP
7G16	29	Sulfur storage warehouse	Fast Track for SAP
7G16	64	Substation for SAP plant	Fast Track for SAP
7G16	11	Rack room for SAP plant	Fast Track for SAP
7G16	71	Cooling Water Station for SAP plant	Fast Track for SAP
7G16	78	Natural gas boiler	Fast Track for SAP
7G16	79	Air cooler unit	Fast Track for SAP
7G02	00	General (allocated to services)	Fast Track for SAP
7G02	01	Administrative Production Building	Fast Track for SAP
7G02	02	Check Point 1	Fast Track for SAP
7G02	12	Interconnecting Piping/Racks	Partial Fast Track for SAP
7G02	14	Air Compression Station	Fast Track for SAP
7G02	15	Interconnecting water supply and drainage	Partial Fast Track for SAP
7G02	17	Overall Firefighting	Partial Fast Track for SAP
7G02	63	Power Distribution System	Partial Fast Track for SAP
7G02	65	Substation for administrative area	Fast Track for SAP
7G02	69	H ₂ SO ₄ loading storage unit	Fast Track for SAP
7G02	72	Demineralized and Industrial Water Station	Fast Track for SAP
7G02	75	Waste water treatment	Fast Track for SAP
7G02	76	Fire water pump station	Fast Track for SAP
7G02	77	Liquid nitrogen station	Fast Track for SAP
7G02	80	Drainage Basin	Fast Track for SAP
7G02	87	Truck Scale	Partial Fast Track for SAP
7G02	89	Railway (Rail Scale)	Partial Fast Track for SAP
7G02	90	H ₂ SO ₄ loading hoses	Fast Track for SAP
7G02	91	Main Guard House	Fast Track for SAP
7G02	92	Temporary Waste Stockyard	Fast Track for SAP

Plant No.	Unit/Sub-unit No.	Unit/Sub-unit name	Remark
7G02	93	Plot Plan	Partial Fast Track for SAP
7G02	94	Interconnecting telecommunication	Partial Fast Track for SAP
7G02	95	Maintenance Workshop	Fast Track for SAP
7G02	96	Logistics Guard House	Fast Track for SAP
7G02	97	Check Point	Fast Track for SAP
7G02	98	Natural gas distribution station	Fast Track for SAP
7G02	99	Chemicals Storage Warehouse	Fast Track for SAP

1.1 ABBREVIATIONS AND ACRONYMS

The list of abbreviations used in this document is provided in the below table:

Abbreviation	Description
OWNER/ CUSTOMER	EuroChem Karatau, Limited Liability Company
CNCEC	China National Chemical Engineering Group Corporation Ltd.
Plant	Main process units inside the Facility
MT	Metric Ton
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
BFW	Boiler Feed Water
CSC	Car Seal Close
CSO	Car Seal Open
EOR	End of Run
SOR	Start of Run
GA	General Arrangement
HMB	Heat and Mass Balance
IPDS	Instrument Process Datasheet
OSBL	Outside Battery Limit
ISBL	Inside Battery Limit
MSDS	Material Safety Datasheet
NPSHa	Net Positive Suction Head Available
TEMA	Tubular Exchanger Manufacturers Association
TL	Technology Licensor
TSV	Thermal Safety Valve
P&ID	Piping & Instrumentation Diagram
PDS	Process Datasheet
PFD	Process Flow Diagrams
PSV	Pressure Safety Valve
PVRV	Pressure Vacuum Relief Valve
SIL	Safety Integrity Level

1.2 FACILITY CONTENT, PLANT TYPES

The Facility is mainly composed by the following plants:

1.2.1 Sulfuric acid plant (SAP-7G16)

One single train

Starting from Solid Sulphur

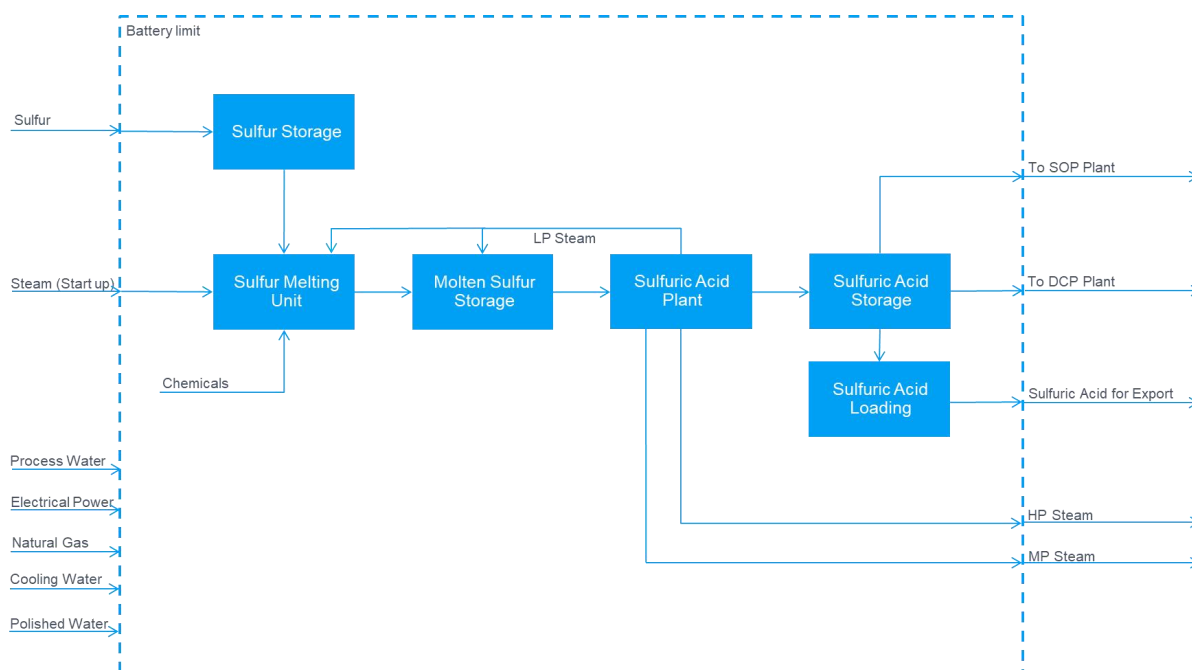
Total Production capacity: 800000 MT/year +10% overdesign

Technology Licenser: Nanjing Hailu Chemical Technology Co., Ltd., China

Plant includes also:

- Unloading and storage of lump sulphur
- Storage of sulphuric acid product
- Waste heat boiler is considered part of the utilities of the facility
- The M.P. steam produced by the SAP is delivered to Air cooler unit in SAP plant.

The “3+2” twice conversion and two steps absorption sulfuric acid process may be divided into the following steps:
 The sulfuric acid plant shall be designed for a capacity of 800 thousand tons of sulfuric acid per year or 2,400 tons / day (in terms of 100% H₂SO₄) shall be provided. The maximum productivity of the plant is 110% of the nominal one or 2,640 tons/day.



For the Fast-Track Sulfuric Acid Plant as part of the chemical complex, which includes units as follows,

- Sulfuric Acid production unit with capacity of 800 ktpa
- Off – Sites & Utilities
- Infrastructure

1.2.2 Start up boiler (7G16-78)

The Natural gas boiler is used for the start-up of the SAP plant since the steam is not available before the waste heat boiler of SAP plant going into service. The steam generated from boiler is mainly used for the melting of the sulfur and deaerator.

The main design scope of this unit is: the boiler room, steam boiler, Thermodynamic system and burn system. All specialties of this unit, including the electrical, thermal control, telecommunications, water supply and drainage, HVAC, equipment, building, structure, general layout, budget and design of other specialties.

Boiler

Rated evaporation capacity:	50 t/h
Superheated steam pressure:	4.4 Mpa
Superheated steam temperature:	416℃
Feed water temperature:	104℃

Thermodynamic system

The scale of boiler room is one 50 t/h gas boiler, considering natural gas as the fuel of boiler, estimating rated load fuel consumption is 3900 Nm³/h. The main steam pressure is 4.4 MPaG, main steam temperature is 416 ℃, boiler feed water temperature is 104 ℃ and provided by deaerator of sulfur plant.

Auxiliary system of boiler room consists of a Feed water dosing system.

Boiler room design is in accordance with the national standard.

The boiler feed water provided by the deaerator of sulfur plant.

Circulating cooling water is supplied by the circulating station of the plant.

One set of Blower is set up for the boiler in the boiler room.

Boiler fuel is natural gas. The pressure of the gas is about 4 barg. The Pressure regulating system is set in the room.

1.2.3 Air Compression Station (7G02-14)

The unit is designed to provide both IA and PA for SAP Plant during fast track and further for SOP, DCP and CaCl₂ Plant in future.

Unit consists of:

- 02-14K01 Air Compressor, capacity 1200 Nm³/h, screw type (oil-free), with VFD
- 02-14K02A/B Air Compressor, capacity 1200 Nm³/h, screw type (oil-free)
- 02-14U01A~C Drying Unit, capacity 1200 Nm³/h, adsorption type
- 02-14V01 Intermediate Buffer Tank, size Φ1000×H2500
- 02-14V02 PA Buffer Tank, size Φ2000×H7000
- 02-14V03 IA Buffer Tank, size Φ2000×H7000

02-14K01+02-14K02A/B Air Compressor

The compressor is to provide both IA and PA for SAP Plant during fast track and further for SOP, DCP and CaCl₂ Plant in future. Under the worst case, one is in operation, one is in maintenance and one is backup.

02-14U01A~C Drying Unit

Three drying units are assigned to 3 compressors.

02-14V01 Intermediate Buffer Tank

One vertical tank will be used to provide gas buffer during compressor switch to avoid pressure fluctuation. The tank is designed for 10 barg @ 80°C.

02-14V02 PA Buffer Tank

One vertical tank will be used to provide gas buffer for SAP Plant during fast track. The tank is designed for 10 barg @ -42/80°C.

02-14V03 IA Buffer Tank

One vertical tank will be used to provide a buffer time of 10min for SAP Plant during fast track. The tank is designed for 10 barg @ -42/80°C.

1.2.4 Liquid Nitrogen Station (7G02-77)

The unit is designed to provide nitrogen for natural gas system purging and replacement.

Unit consists of:

- 02-77V01 Liquid Nitrogen Storage Tank, size $\Phi 3000 \times H10m$
- 02-77E01 Pressure Booster, capacity 100Nm³/h, plate fin type
- 02-77E02 Evaporator, capacity 1000Nm³/h, plate fin type
- 02-77E03 Electric Heater, capacity 1000Nm³/h, water bath type
- 02-77V02 Buffer Tank, size $\Phi 1200 \times H3000$

02-77V01 Liquid Nitrogen Storage Tank

One vertical tank will be used to store liquid nitrogen. The inner tank is designed for 16 barg @ -196/80°C.

02-77V02 Buffer Tank

One vertical tank will be used to provide gas buffer. The tank is designed for 10 barg @ -42/80°C.

1.2.5 H₂SO₄ Loading Hoses (7G02-90)

The unit is designed to provide 12 loading arms for daily 3 shifts operation. The loading operation for each shift shall be finished in half an hour.

The production of SAP Plant is 100t/h of 100% H₂SO₄. As for 93% H₂SO₄, the production is about 58.7 m³/h. The required capacity for each loading arm is about 78.3 m³/h.

Unit consists of:

- 02-90Z01A~L H₂SO₄ Loading Arm, top-loading type, hydraulic operated
- 02-90P01 Spillage Collection Pump, pneumatic diaphragm type, 1m³/h
- 02-90V01 Spillage Collection Tank, size $\Phi 1000 \times H1000$

02-90Z01A~L H₂SO₄ Loading Arm

The design capacity of each loading arm is 80 m³/h.

1.2.6 H₂SO₄ loading storage unit (7G02-69)

The unit is designed to store 98% H₂SO₄ for loading.

Unit consists of:

- 02-69TK01A/B H₂SO₄ Loading Tank, size Φ21m×H14.5m
- 02-69P01A~D, H₂SO₄ Loading Pump, magnetic type, capacity 300 m³/h

02-69P01A~D H₂SO₄ Loading Pump

The required capacity for each pump is $55.46/24/3/0.5/3=296$ m³/h.

1.2.7 Natural gas distribution station (7G02-98)

The unit is designed to provide filtration, metering and depression of HP natural gas from OSBL. The produced LP natural gas is then connected to piping network (header).

Unit consists of:

- 02-98U01 Natural Gas Metering Unit
- 02-98V01 Natural Gas Knockout Drum, size Φ1200×H3000
- Depression valve module

02-98U01 Natural Gas Metering Unit

The unit consists of two trains of filtration and metering. The capacity of each train is 17000 Nm³/h.

Depression valve module

The module consists of 4×33% duty depression valve, allowing for the pressure reduction from 30barg to 4barg for customers use.

1.2.8 Cooling water station for SAP plant (7G16-71)

Cooling water supply capacity is 7000 m³/h.

Unit consists of:

- 2×3500 m³/h Mechanical ventilation count flow cooling towers
- (2+1)×3500 m³/h Cooling water pumps
- 1 set of side stream filter
- 1 set of chemical injection unit
- All necessary piping, instrumentation and electrical accessories within B.L.

1.2.9 Demineralized and Industrial Water Station (7G02-72)

Demineralization and industrial water station is composed of raw water filtration, industrial water producing demin. water and condensate refining producing demin. water.

Demineralization and industrial water station service for whole plant (including thermal power plant). Raw water filtration capacity is 400m³/h. demin. water is separated to two water qualities: primary demineralized water (RO1 permeate) capacity is 240m³/h; demineralized water (RO2 permeate) capacity is 70m³/h.

1.2.10 Fire water pump station (7G02-76)

Total capacity: 180m³/h

Unit consists of:

- 2×300 m³ Fire water storage tanks
- (1+1)×180 m³/h Fire water pumps
- (1+1)×18 m³/h Fire water jockey pumps
- All necessary piping, instrumentation and electrical accessories within B.L.

1.2.11 Waste water treatment (7G02-75)

Waste water treatment capacity is 150 m³/h. Treated water will be reused as cooling water make up water for SAP plant. Concentrated salty waste water is discharged to evaporation pond OSBL (no more than 16.5 m³/h for average).

1.2.12 Drainage basin (7G02-80)

Total volume: 4000m³

Unit consists of:

- 2×200 m³ Drainage basins
- (2+1)×40 m³/h Waste water pumps

All necessary piping, instrumentation and electrical accessories within B.L.

1.3 LIFE TIME

All equipment and components of the Facility shall have a design life of 25 years, provided that required scheduled and unscheduled maintenance are correctly implemented.

For the equipment, the minimum service life shall be:

- technological equipment and pipelines - 20 years.
- high pressure equipment (reactors, heat exchangers, etc.) - 30 years.

1.4 WORKING SHIFTS

Facility operations based on 2 shifts per day. (12h)

The Plant should be designed for continuous operation during 8,000 hours/year.

1.5 CODES AND MEASURE SYSTEMS

The engineering design will be adapted to comply with Kazakhstan standards and regulations. For equipment, machinery, civil, packages units, the Chinese codes will be used.

2 SITE CONDITIONS

2.1 ENVIRONMENTAL DATA

2.1.1 Ambient Air temperature

Absolute maximum, according to the request from Kazgidromet +47°C

Absolute minimum according to the request from Kazgidromet -42 °C

The temperature of the coldest day with the probability of 0.98 is -35.6°C and with the probability of 0.92 is -28.4°C.

The temperature of the coldest five-day period with probability 0.98 is -33.4°C and with probability 0.92 is -25.6°C.

All these temperature data are needed to select equipment materials (tanks, pressure vessels, etc.)

Climatic sub-area of the construction site is IVГ (Annex A, Figure A1, SP RK 2.04-01-2017*);

Air temperature of the coldest five-day period with a probability of 0.92 - minus 21.1°C.

(Table 3.1, Taraz, Zhambyl Region, according to cl. 3.1, SP RK 2.04-01-2017*);

Average duration (days) and air temperature (C°) of periods with average daily air temperature (C°) not exceeding 8° - 160 days and 1.7°

(Table 3.1, Zhambyl Oblast, Taraz city, according to cl. 3.1, SP RK 2.04-01-2017*);

2.1.2 Air barometric pressure

- | | |
|--------------------------------|-----------------------|
| - Average site height | 650 m above sea level |
| - Average atmospheric pressure | 94.6585 kPa |

2.1.3 Relative humidity

- | | |
|-------------------|------------------|
| - Summer average | 32 % for a month |
| - Winter average | 85 % for a month |
| - Design maximum: | 32% summer |
| - Design minimum: | 85 % winter |

2.1.4 Rain

- | | |
|---------------------------|--|
| - Average annual rainfall | 420 mm |
| - Peak rainfall | 40 l/s per 1 ha for 20 min = 4.8mm in 20 minutes |
| - Rainfall period | 40 days/year |

2.1.5 Wind

- | | |
|---------------------|---------------|
| - Design Wind Load: | 100 kg/m2 (*) |
|---------------------|---------------|

According to the NP to the SP RK EN 1991-1-4:2005/2011 Annex 4, the standard wind pressure for the V area is 100 kg/m2.

- | | |
|------------------------------|---|
| - Prevailing wind direction: | December-February-south;
April-October-north |
| - Average wind speed: | 14.4 km/h |

According to the NP to the SP RK EN 1991-1-4:2005/2011 Annex 4, the average wind speed for the III region is 14.4 km/h.

- Wind rose (%) (*):

N	7
NE	17
E	18
SE	10
S	7
SW	17
W	16
NW	8

(*) - reference standard SNIP RK 2.01.07-85 "Loads and impacts".

2.1.6 Earthquake

- Seismic factor intensity 7 on the MSK-64 scale
- Peak ground acceleration 100 cm/s² (*)

(*) - reference standard SP RK 2.03-30-2017 . Construction in seismic zones, with amendments 2021-10-21

2.1.7 Snow load and freezing depth:

- Extreme snow load 360 kg/m²
- Snow Load 180 kg/m²
- Freezing depth (According to the 2017 survey) For IGE-1 - 0.78m / For IGE-2,3,4 - 1,1 m

2.1.8 Soil characteristics:

- Soil type clay Loam+ stony type (**)
- Maximum allowable soil pressure (**)

(**) - Detailed data is described in 23.117.08-ES2-01_0_EN, Geological Engineering Survey Report.

2.1.9 Minimum Metal Design Temperature (MDMT)

Minimum metal design temperature for Piping

For the design, negative air temperature when selecting materials and products for pipelines should be taken:

- 1) the average temperature of the coldest five-day period in the area with a probability of 0.92, if the working temperature of the wall of the pipeline under pressure or vacuum is positive: -25.6°C.
- 2) absolute minimum temperature of this region, if the working temperature of the wall of the pipeline under pressure or vacuum can become negative from the effects of ambient air. (instrument air, e.t.c.): -42 °C

- Minimum metal design temperature for Equipment : See paragraph 2.1.1

- Minimum Metal temperature for steel Structures : -26.7 °C

2.2 LOCATION OF MINING COMPLEX

Plant Location:

- latitude 43°20'35"
- longitude 69°30'10"

Area available for the Facility with global coordinates.

2.3 IDENTIFICATION OF PICK-UP / DELIVERY

- Main railway for materials input / output
- Main roads
- OSBL Effluents collection point
- National Power supply network

2.4 MATERIALS HANDLING

Railways is the preferred vehicle for incoming and outgoing flow materials. Two railways connection are actually foreseen with one single connection to the external railway. This is to be verified during FEED Engineering.

3 RAW MATERIALS

The following raw materials shall be available at plant BL.

Eurochem to provide raw materials specification for the items indicated.

3.1 RAW MATERIALS FOR SAP PLANT

Solid Sulfur:

Granulated sulfur with a granule size of 0.5-8.0 mm will be used.

Notes: Provided by ATQ-CNCEC-EKLLP-00029-000-MEC from EuroChem dated on 2023/5/24.

- | | | |
|--|-----------------|-------|
| - Mass fraction of sulphur | % not less than | 99.90 |
| - Mass fraction of ash | % not more than | 0.05 |
| - Mass fraction of organic matter | % not more than | 0.06 |
| - Mass fraction of acids expressed as sulphuric acid | % not more than | 0.004 |
| - Mass fraction of water | % not more than | 0.2 |
| - Mechanical impurities | Nil | |

4 PRODUCTS SPECIFICATION

4.1 SULFURIC ACID FROM SAP PLANT

- Type Technical grade sulfuric acid
- Concentration 98%
- Impurities

Parameter	Guaranteed Figure	Notes
H ₂ SO ₄ wt%, not less	98	Minimum Level, 93%
Fe wt% , not more	0.006	
Residue after calcination wt%, not more	0.02	
Transparency.	Equal or more than 80mm	

5 UTILITIES AVAILABLE

5.1 ELECTRICAL POWER SUPPLY

In the Project shall be used the following voltage levels:

- Medium voltage (MV) power distribution switchboard: 6 kV – 50 Hz
- Power generation: 6 kV – 50 Hz
- Motor greater than or equal to 500 kW: 6 kV – 50 Hz
- Electric motor small than 500 kW: 0.4 kV – 50 Hz
- Low-voltage (LV) distribution: 400/230 V – 50 Hz
- Medium voltage (MV) for Grinding of phosphate ore: 6 kV – 50 Hz

Applicable to MV:

- Voltage of protective circuits 230V – DC
- Voltage of auxiliary circuits 230V – DC
- Voltage as for space heater and internal lighting 230V - 50 Hz AC

Applicable to LV switchgear (PMCC, MCC, etc.):

- Voltage of protective circuits 230V - 50 Hz
- Voltage of auxiliary circuits 230V – 50 Hz
- Uninterruptible power supply system (UPS): 400/230 V or 230 V – 50 Hz
- DC (DCP): 230 VDC
- CCS (from UPS): 230V – 50 Hz

Grounding Requirements:

- MV system: isolated neutral

- LV system: direct grounding (TN-S system)

Voltage Drop

a. Maximum voltage drops on bus

At the frequent starting of motors 10%

At the non-frequent starting of motors 15%

b. Voltage drops in the cable recommended value

From MCC to motors 4%

Lighting branch circuit 5%

The above percentage may vary slightly, but the total voltage drops from substation bus to end-user shall not exceed 5% with reference to the rated voltage.

5.2 INDUSTRIAL WATER

Industrial water quality refers to the table below:

Acidity, Ph	7.5
Turbidity (mg/dm ³)	0.05
Permanganate oxidizability (mgO ₂ /l)	0.24
Hardness (mmol/dm ³)	5.1
Alkalinity (mmol/dm ³)	1.1
Salt content (mg/dm ³)	583.91
Iron (mg/dm ³)	0.01
Calcium (mg/dm ³)	112.04
Magnesium (mg/dm ³)	55.82
Sulphates (mg/dm ³)	83.91
Chlorides (mg/dm ³)	259.89
Aluminium (mg/dm ³)	0.215
Soluble silicate ion (mg/dm ³)	4.4
Colloidal silicate ion (mg/dm ³)	0.59
Fluorides (mg/dm ³)	0.516
COD (chemical oxygen consumption) (ppm)	≤ 3
Organic matter	absent
Fe, Mn, Al (ppm)	≤ 0.3
Bacterial count (CFU/ml)	100

Note: Water actual composition will be subject to seasonal fluctuations.

Operated and design conditions for industrial water refer to the table below:

Item	Operating Pressure/MPaG	Operating Temp/°C	Design Pressure/MPaG	Design Temp/°C
Industrial water	0.3	AMB	0.6	60

5.3 POTABLE WATER

Utility and drinking water has to be supplied to sanitary appliances, electric water heaters for hot water preparation, watering taps and emergency showers.

Potable water quality meets the requirement of "Sanitary rules" 16.03.2015 № 209.

The system has to be fed from the potable water supply pipeline. Water metering units should be installed at the water pipeline inlets.

Operated and design conditions for potable water refer to the table below:

Item	Operating Pressure/MPaG	Operating Temp/°C	Design Pressure/MPaG	Design Temp/°C
Potable water	0.6	AMB	0.8	60

5.4 COOLING WATER

Cooling Water quality for SAP Plant is as follow:

Item and unit	Value
Acidity, Ph	6.8~9.5
Turbidity (mg/dm3)	≤20
Hardness (mmol/dm3)	≤5
Iron (mg/dm3)	≤1
Chlorides (mg/dm3)	≤300
COD (chemical oxygen demand) (ppm)	≤ 100
Free chlorine (ppm)	0.1~1
TDS (ppm)	≤2000

Operated and design conditions for cooling water supply and return refer to the table below:

Item	Operating Pressure/MPaG	Operating Temp/°C	Design Pressure/MPaG	Design Temp/°C
Cooling water supply	0.35	32	0.8	60
Cooling water return	0.20	42	0.8	60

5.5 NATURAL GAS AS FUEL

- Within the battery limits, the fuel is natural gas.
- Shall be supplied at Battery Limit According to ST RK 1666-2007 "Gases flammable natural, supplied and transported by main pipelines. Technical conditions."
- Characteristics in accordance with GOST 5542-87
- Lower heating value @ 20°C, 101 325 kPa >= 32,5 MJ/m³
- Pressure at battery limit 30 barg

Natural gas is supplied to the site of the phosphate processing chemical complex from the designed high-pressure gas pipeline (3.0 MPa) of the Automated Gas Distribution Station "Karatau – Zhanatas, Sarysu district". There are two different lines for natural gas: a high-pressure line (design pressure 40 barg) and a low-pressure line (design pressure 8 barg).

Natural gas must be supplied at the battery limit in accordance with STRK 1666-2007 "Flammable natural gases. Combustible natural gases supplied and transported via main pipelines. Specifications".

Normal operating conditions (HP natural gas):

- Working pressure (from battery limits) 30 barg
- Working temperature -20 ~ + 40 °C

Normal operating conditions (LP natural gas):

- Working pressure 4 barg
- Working temperature -20 ~ + 40 °C

Design data:

- HP natural gas, design pressure 40 barg
- HP natural gas, design temperature -26.7 ~ +60°C
- LP natural gas, design pressure 8 barg
- LP natural gas, design temperature -26.7 ~ +60°C
- The consumers of the chemical complex are supplied with medium-pressure natural gas. To reduce natural gas pressure, the Gas Distribution Station must be provided.

Composition of natural gas

Component	Composition (Mole fractions)	
	Bozoy (Gas field 1)	Kazgermunay (Gas field 2)
Methane	8.90E-01	7.41E-01
Ethane	5.85E-02	1.66E-01
Propane	2.05E-02	5.69E-02
i-Butane	2.25E-03	3.70E-03
n-Butane	2.99E-03	6.10E-03
22-Mpropane	1.10E-05	0
i-Pentane	3.52E-04	5.00E-04
n-Pentane	2.42E-04	4.00E-04
n-Hexane	1.20E-05	0
n-Heptane	8.00E-07	0
n-Octane	0	0
CO2	7.10E-04	1.70E-03
Nitrogen	2.40E-02	2.45E-02
Helium	3.93E-04	0
Hydrogen	2.50E-06	0
Oxygen	6.70E-05	0
MW	18 Kg/Kmol	20.77 Kg/Kmol
LHV	47.55 MJ/Kg (36.28 MJ/m3)	47.02 MJ/Kg (41.43 MJ/m3)

Notes: Provided by thermal power engineer of EuroChem dated on 2023/8/10.

5.6 INSTRUMENT AND PLANT AIR

The operating and design parameters of both instrument air and plant air must be as per Class 2, DIN ISO 8573-1, or better:

- Dewpoint: -40 °C
- Pressure (minimum/normal/working): 4.5 / 7 / 7.5 barg
- Normal ambient: temperature
- Mechanical design pressure: 10 barg
- Mechanical design temperature: -42 ~ +60°C
- Dust content: < 1 mg/m³
- Particle size: < 1 µm
- Oil content: < 0.01 mg/m³

5.7 STEAM

Item	Operating Pressure/MPaG	Operating Temp/°C	Design Pressure/MPaG	Design Temp/°C
MP superheated steam	4.4	416	FV/5.2	450
LP steam	0.85	178	FV/1.3	250
LLP steam	0.3	144	FV/1.0	180

5.8 PRODUCT USAGE SPECIFICATION

The usage of products shall be identified to allow the proper storage facilities and materials handling. The following table summarizes the figures to be used.

Product	Plant	Total annual	For sale	For captive use
H ₂ SO ₄ phase 1	SAP	100%	100%*	
H ₂ SO ₄ phase 2 or future	SAP	100%	60%	40%

(*) Loading and unloading to be foreseen.

6 EFFLUENT EMISSION LIMITS

The following are the emission limits to be considered for the complex in accordance to Kazakh law.

6.1 EMISSION TO THE ATMOSPHERE

SAP plant:

Material	Project Limit
----------	---------------

- SO₂ content: 350 mg/Nm³

- Acid mist + SO₃ content: 35 mg/ Nm³
- H₂S: 5 mg/ Nm³
- NO_x: 200 mg/ Nm³

6.2 WASTE WATER

The waste water discharge to evaporation pond in the southeast is no more than 16.5 t/h.
Sanitary waste water is discharged to existing Phosphate Oral Processing Plant for treatment.

6.3 SOLIDS WASTES

Sulfur residue production: t/a	1760
Composition of sulfur	98%
Ash	0.20%
Acidity(Calculated by sulfuric acid)	0.02%
Arsenic(Auxiliary materials required for filtration)	0.05%