Annex No. 2 to the Request for Proposal No. 1/DN/2024 - Detailed requirements

1 PART OF THE SUBJECT OF THE ORDER

Delivery and launch of the technological process for calcination of calcium sulphate dihydrate with a capacity of 30 t/h of the final product, heated with saturated steam from a gas steam generator, with specific parameters of the final product and specific efficiency of the production process, including:

a) technological design of the calcium sulphate dihydrate calcination installation in a device heated by technological steam, with all the necessary additional designs necessary for the physical implementation of the project (including the electrical power supply of the devices, compressed air installation, containing guidelines necessary for the implementation of the construction design and supporting structures, static and dynamic loads) ;
b) delivery of a control system enabling ongoing monitoring of the energy consumption of all electrical devices, allowing the process to be controlled automatically, also by artificial intelligence algorithms, enabling the prediction of electricity demand in subsequent hours of operation of the installation;
c) ensuring supervision of the installation and commissioning of devices and the entire process, as well as their optimization in terms of selecting optimal process operating parameters in terms of product quality, electricity consumption and safe operation of devices.

Raw material parameters before the process:

Raw materials values FGD gypsum:

No	Parameters	Parameters	Unit	Values
1	Humidity	Humidity	%	≤ 10
2	Contents	CaSO4*2H2O	%	≥ 95
3	Grain size	Feed size	mm	≤ 0.2
4	Grain share	Fed size D50	µm	30÷60
5	Contents	SiO2	%	≤0.50
6	Contents	Cl	ppm	≤ 100
7	Contents	MgO (water soluble)	%	≤ 0.10
8	Contents	Na2O (water soluble)	%	≤ 0.06
9	Contents	CaCO3 + MgCO3	%	≤ 2.0
10	Indicator	pH	-	5÷9

Material parameters after the calcination process

Requirements for gypsum binder for gypsum plasters.

Requirements for gypsum binder for gypsum plasters.

No	Parameters	Unit	Values
1	Humidity after all process1	[%]	0.00
2	Crystal water after calcination process2	[%]	3.5÷5.0
3	Crystal water after cooling process2	[%]	5.5÷6.0
4	Initial setting time3	[min]	8÷15
5	Final setting time3	[min]	20÷40

1 – tested in 50°C
2 – tested in 350°C
3 – tested according to EN 13279-2

PART 2 OF THE SUBJECT OF THE ORDER

Delivery and launch of the semi-water gypsum grinding process from the dihydrate gypsum calcination process with a capacity of 30 t/h, including:

a) technological design of the installation of the calcium sulphate hemihydrate grinding process in the device, with all additional designs necessary for the physical implementation of the project (including the electrical power supply of the devices, compressed air installation, containing guidelines necessary for the implementation of the construction design and supporting structures, static and dynamic loads).
b) delivery of a control system enabling ongoing monitoring of the energy consumption of all significant electrical devices, allowing the process to be controlled automatically, also by artificial intelligence algorithms, allowing the prediction of electricity demand in subsequent hours of installation operation.
c) ensuring supervision of the installation and commissioning of devices and the entire process, as well as their optimization in terms of selecting optimal process operating parameters in terms of product quality, electricity consumption and safe operation of devices.

Material parameters after grinding semi-aqueous gypsum

D_{50} = 33 – 38 µm

or changing the D_{50} by 5 - 10 µm of the product grain size before the grinding process

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Description of the technological process to which the order applies(the implementation of part 1 and part 2 is necessary for the proper implementation of the process - suppliers for individual parts will be responsible only for the correct implementation of the process in the scope of the defined part)

The dihydrate gypsum calcination installation (CaSO4 +2 x H2O) is heated with saturated steam produced in a steam generator with a capacity of 17t/h. The steam flows through the exchanger in the rotary calciner, cools down and leaves the calciner as hot condensate. The process of heat dissipation takes place through the walls of the tubes along which the material flows. The water vapor generated in the material space is sucked out by the air flow system to the bag filter, and the material is mechanically poured into the cooler. The time of passage through the rotary calciner and the cooler should be selected so that the process ensures work efficiency of 30 tons per hour of the finished product.

The steam generator is powered by a local liquefied natural gas station (LNG), with natural gas after the evaporation process with a calorific value of 10,382 kWh/m^3. The steam generator provides saturated steam at a temperature of 212°C and an amount of 17 t/h, which is fed to the rotary calciner in gaseous form, through a system of control valves, at a pressure of 1.2-1.5 MPa.

After the calcination process, the material should be cooled in a rotary cooler to a temperature of 70°C, then transported to ensure negative pressure and tightness, the material should be fed mechanically to the grinding system, where its grain size is reduced by 5 - 10µm.

After the grinding process, the material is mechanically transported to storage silos. The mechanical transport system consists of tight screw conveyors and vertical elevators with dust extraction systems. Storage silos ensure the continuity of the calcination process and enable production planning at the gypsum products mixing plant as well as loading onto tank trucks for transporting the material to the customer.

The calcination process and the grinding process have independent dust removal systems from which the material is returned to the start-up silo where the material from the start-up of the installation is stored, and then dosed to the raw material at the entrance to the process.

The entire gypsum calcination process should ensure the tightness of the transport system and provide filtration of the exhaust air in accordance with EN ISO 16890-1:2016, ensuring emissions from each emitter are less than 20 mg/Nm3.

All places requiring lubrication and service should be marked and described, the entire installation should meet the requirements of CE and the safe operation of machinery standard 2006/42/WE (2006/42/EC).

The installation should be equipped with measurement and work control systems, motion and pressure sensors, as well as material level sensors, where required for efficient automatic process execution. The installation should ensure monitoring and the ability to control and archive electricity consumption and cooperate with a control system with learning artificial intelligence algorithms in order to optimize the operation of the installation in terms of electricity consumption (device operation control).

The control system should be provided by a PLC controller with appropriate software and visualization, allowing the operator to control and control the process in automatic or manual mode.

Power parameters

The installation will be powered by alternating current with an average voltage of 400V, the power of the installed devices should not exceed 1,200 kW rated current.

The voltage of the control signals is 24 VDC (volts direct current), 0 - 20 mA.

Ethernet communication protocol – Profinet.

Device requirements

All devices must be CE certified and meet the Safe Operation Directive 2006/42/EC (2006/42/EC).

All equipment except electric drives and safety covers will be in RAL9002, this also applies to electrical cabinets and supporting and auxiliary structures.

Each device should have an operating manual and information on maintenance methods.

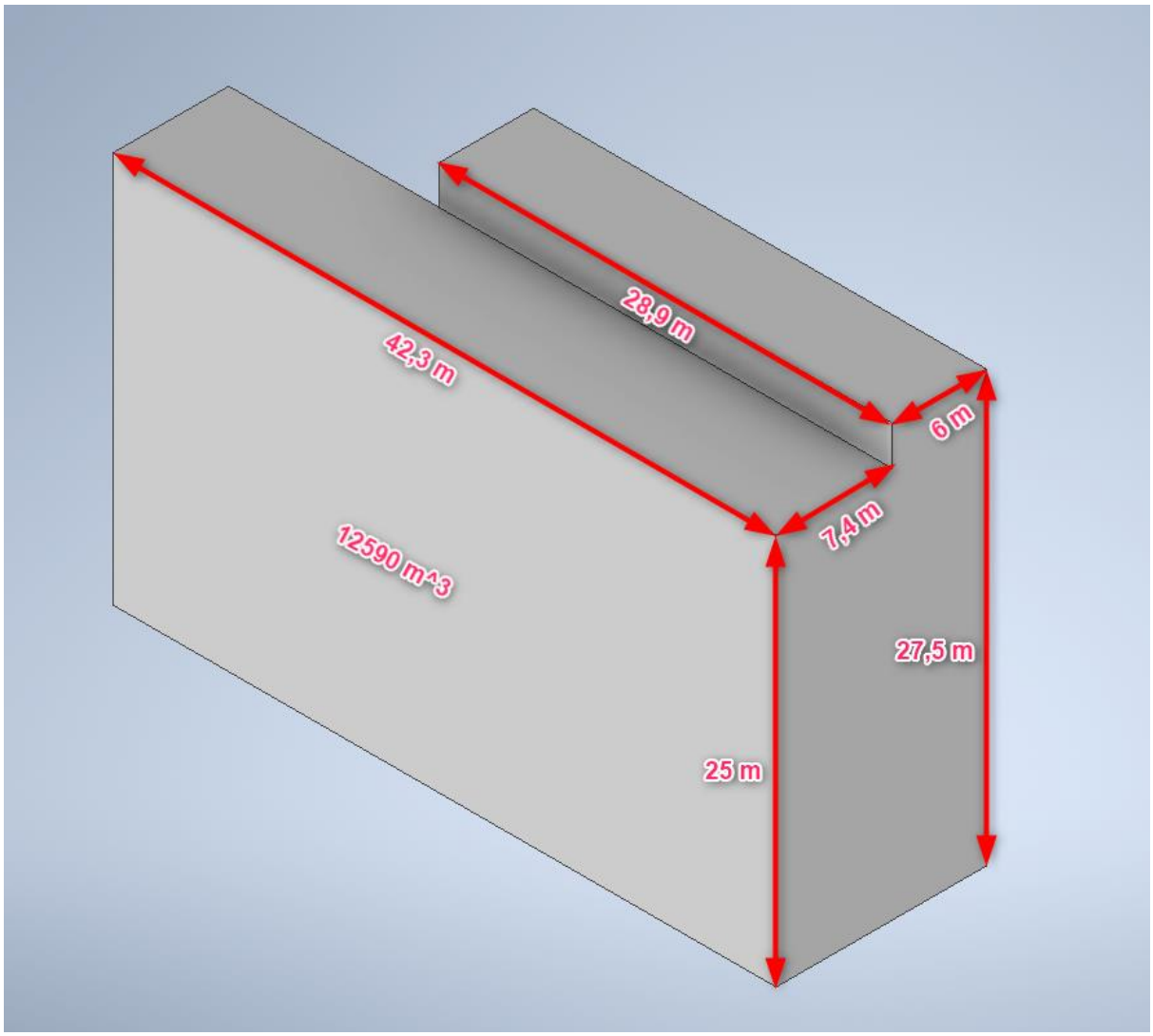
The subject of the delivery will be a PLC control system and power supply documentation in the form of a design of cabinets and power supply cabinets for device drives (MCC), with the exception of devices supplied by sub-suppliers. The electrical documentation should include a list of devices and their characteristic electrical parameters, a list of security equipment in power supply cabinets and appropriate marking of cables and cross-sections of electrical connections.

The supplier will provide information about places requiring thermal insulation and will provide for its implementation through appropriate design solutions.

Thermal insulation, with the exception of devices that can be delivered as insulated, e.g. fans, will be performed by the Ordering Party after installation of the devices.

Development plan and accompanying processes

Proposed building volume with a calcination and gypsum grinding installation



Design requirements for the design of steel structures and foundations

Requirements for reinforced concrete structure

1. Static and dynamic forces from devices
2. Anchors - arrangement of anchors for mounting devices in reinforced concrete foundations
3. Requirements for limiting the settlement of supports for devices
4. Tolerances for the construction of foundation supports for devices

Requirements for steel structure:

1. Static and dynamic forces from devices,
2. Diagram of anchoring devices to steel elements - arrangement of anchors for mounting devices.
3. Limit displacements and deflections for steel elements for technological equipment.
4. Permissible vibrations for steel structure platform elements and the entire global system of the facility.
5. Distribution of forces against technological countermeasures against technological devices
6. Arrangement of forces from the dedusting elements of the technological system