PROCHEM
ul. Powązkowska 44C, 01-797 Warszawa
Tel.: (48 22) 32 60 100 www.prochem.com.pl

SODACONSULT
BIURO TECHNOLOGICZNE S.C.
CONSULTING & ENGINEERING OFFICE

EXECUTIVE PROJECT
STAGE II
TECHNICAL SPECIFICATION
OF A FILTER PRESS WITH PERIPHERAL EQUIPMENT
pos. E1.1101d,e, E1.1102d,e, E1.1111d,e, E1.1130a,b, E1.1140a,b

PROJ. NO. 130008
DOC. NO. E2E1_1101U07201REWA

INVESTOR:
SODA POLSKA CIECH S.A.
88-101 INOWROCŁAW, UL. FABRYCZNA 4

INVESTMENT:
INTENSIFICATION OF SODA ASH PRODUCTION BY 200,000 TONS/YEAR AT SODA POLSKA CIECH IN INOWROCŁAW

FACILITY:
FACILITY NO. E1.12 UTILIZATION - FILTRATION

Position	Title and full name	Authorization no.	Date	Signature
Designed by	mgr inż. Michał Kuciel	n/a	07.2014	
Chief Designer	mgr inż. Michał Kuciel	n/a	07.2014	
Reviser	Marianna Kozioł, Stanisław Smyk inż. Zdzisław Trzeciak	n/a	07.2014	
Project Manager	mgr inż. Bartosz Smyk mgr inż. Cezary Gąsiorowski	n/a	07.2014	

Cracov, July 2014

CONTENTS: **page**

1. FILTER PRESS SYSTEM

Function of the filter press system is separation of sediment from liquid.
This request for proposal includes the full filtration system, i.e.: the filter presses, the sludge pumps supplying the presses, the belt conveyor under the press, the air compressor and another necessary devices composing the filtration system.
A Supplier of the filtration system should submit their offer for delivery of devices for the complete filtration system.
Location of the main devices is shown in the drawing E2E1_1101U07301 enclosed to the request for proposal.

2. FILTER PRESSES - POS. E1.1101D,E

2.1. Intended use and operating conditions

The filter presses are used to separate sediment consisting mainly of calcium carbonates and sand from liquid consisting mainly of calcium chloride $CaCl_2$ and sodium chloride NaCl.

2.2. General data

Item	Parameter	Value
1	Device name	*Filter press*
2	Delivery item	*E1.1101d,e*
3	Number of pieces	*2*
4	Project number	*Intensification of soda ash production by 200,000 tons/year at Soda Polska CIECH in Inowrocław*

2.3. Required device parameters

Item	Parameter	Value
1	*Filter press type*	*membrane type*
2	*Capacity of two press assembly*	*min. 2160 m^3/24 h*
3	*Required content of sediment in filtrate –* ***technological guarantees od the Supplier***	*max 15 mg/dm^3*
4	*Requirements as regards the product –* ***technological guarantees od the Supplier***	*humidity - max 47÷49%*
5	*Preferred thickness of the filtration chamber*	*40 mm*
6	*Filter cake pressure*	*by air*
7	*Installation*	*Mounted on the steel plate at the level +8.400*
8	*Filter press width [m]*	*acc. to a supplier*
9	*Filter press length [m]*	*max 16*
10	*Height [m]*	*acc. to a supplier*

11	*Preferred plate size*	*2000 x 1500 mm*
12	*Assurance of functions*	*- filtration* *- pressing (air pressure)* *- drying (cake blowthrough)* *- supplying collector blowthrough - gravitational cake unloading* *- periodical washing with 2% HCL solution*

2.4. Medium characteristics

Item	Parameter	Value
1	*Feeding medium:*	*Sludge from decantation node*
2	*Performance*	*min. 2160 m^3/24 h*
3	*Form:*	*sludge*
4	*Density:*	*1190 kg/m^3*
5	*Temperature:*	*40 ÷ 65°C*
6	*pH*	*11÷12*
7	*Content of solids in the sludge:*	*80÷140 g/l*
8	*Average chemical composition of the sludge:*	
9	*- SiO2 +NR*	*15%*
10	*- Fe and Al oxides. As R2O3*	*7%*
11	*- chlorides as Cl-*	*6%*
12	*- sulfates as S03*	*2%*
13	*- sodium as Na*	*1%*
14	*- Ca as active CaO*	*10%*
15	*- Ca remaining as Ca*	*34%*
16	*- Mg as MgO*	*3%*
17	*- CO_3 from decomposition of carbonates*	*16%*
18	*Average grain composition:*	
19	*>0.2 mm*	*36.5%*
20	*0.2 ÷0.1*	*28.4%*
21	*0.1 ÷0.063*	*10.8 %*
22	*<0.063*	*24.3%*
23	*Analysis of clear fluid:*	
24	*Content of ions OH^-*	*0.6 g/l*
25	*Content of ions Cl^-*	*47.9 g/l*
26	*Content of ions SO_3^{2-}*	*0.1 g/l*

27	*Content of ions Ca^{2+}*	*20 g/l*
28	*Content of ions Na^{+}*	*15 g/l*
29	*Content of ions NH_4^{+}*	*0.1 g/l*

2.5. Device operating conditions

Item	Parameter	Value
1	*Type of duty:*	*Continuous operation, 24 h*
2	*Number of hours / year:*	*8600*
3	*Execution for food industry*	*No*

2.6. Available energy-related media

Item	Parameter	Value
1	Electric energy	
	– *frequency*	*50 Hz*
	– *voltage*	*400 V – for drives of power ≤ 160 kW* *6 kV – for drives of power > 160 kW* ***Note**: for drives powered through the inverter, low supply voltage (400 V or 690 V) is permissible for drives of power >160 kW*
2	Air for instrumentation and automatics	*Dried and deoiled (after oil compressors)*
	– *pressure*	*6 bar (g)*
	– *dew point*	*(-) 20°C*

2.7. Equipment required

Item	Parameter	Value
1	*Peripheral equipment*	*Equipment specification can be found in the elaboration, clauses 2,3,4,5*
2	*Hydraulic unit with the drive*	*acc. to a supplier*
3	*Extensometer scales*	*acc. to a supplier*
4	*Membrane packet*	*acc. to a supplier; monoblock packet is preferred - non-replaceable membranes*
5	*Control system*	*- controllers: PLC SIMATIC SIEMENS of class S7-300* *- visualization system SCADA SIMATIC WinCC SIEMENS* *- communication network PLC-SCADA: PROFIBUS*

		- drive protections SMOCODE PRO-V with interface PROFIBUS *- frequency converters with interface PROFIBUS* *- measuring transducers with analogue output signal 4-20mA*
6	*Fittings*	*Ensuring correct operation in automatic and manual control mode, acc. to a supplier*
7	*Filtrate receiving tub*	*acc. to a supplier*
8	*Preliminary product comminution*	*Grate for preliminary product comminution installed above the belt conveyor, acc. to a supplier*

2.8. Drive

Item	Parameter	Value
1	*Drive type:*	*acc. to a supplier*
2	*Motor type:*	*acc. to a supplier*
3	*Motor manufacturer:*	*acc. to a supplier*
4	*Motor insulation class:*	*acc. to a supplier*
5	*Protection level:*	*IP 54*
6	*Motor assembly type:*	*acc. to a supplier*
7	*Cooling type:*	*jacket-cooling*
8	*PTC sensors in the winding:*	*within delivery*
9	*Motor power (kW):*	*acc. to a supplier*
10	*Rotational motor speed (rpm):*	*acc. to a supplier*
11	*Supply voltage (V):*	*400*
12	*Frequency (Hz):*	*50*
13	*Coupler type:*	*acc. to a supplier*

2.9. Actually valid pressure values for individual operations

Item	Parameter	Value
1	*Filtration*	*0.6 MPa*
2	*Pressing*	*0.9 ÷1.35 MPa*
3	*Drying*	*0.5 ÷ 0.7 MPa*
4	*Blowthrough of the collector supplying the press*	*0.5 ÷ 0.7 MPa*

3. BELT CONVEYORS E1.1102D,E

3.1. Intended use and operating conditions

The belt conveyor E1.1102d,e is used to receive wet soil lime from the filter presses E1.1101d,e and transport the product onto the conveyor E1.1202. The conveyor shall be placed under the filter press, indoors, at the unheated place.

3.2. General data

Item	Parameter	Value
1	Device name	*Belt conveyor*
2	Delivery item	*E1.1102d,e*
3	Number of pieces	*2*
4	Project number	*Intensification of soda ash production by 200,000 tons/year at Soda Polska CIECH in Inowrocław*

3.3. Required device parameters

Item	Parameter	Value
1	*Rated load (kg/m):*	*acc. to a supplier*
2	*Design load (kg/m):*	*acc. to a supplier*
3	*Rated output (t/h):*	*acc. to a supplier*
4	*Design efficiency (t/h):*	*acc. to a supplier*
5	*Height of medium fall (m):*	*acc. to drawing*
6	*Rate of belt travel (m/s):*	*-*
7	*Adjustment of rate of belt travel:*	*Yes*
8	*Minimum rate of belt travel (m/s):*	*acc. to a supplier*
9	*Average rate of belt travel (m/s):*	*acc. to a supplier*
10	*Maximum rate of belt travel (m/s):*	*acc. to a supplier*
11	*Transport distance (m):*	*acc. to a supplier*
12	*Belt travel directions:*	*Unidirectional*
13	*Installation.:*	*horizontal*
14	*Angle of conveyor inclination*	*Acc. to a Supplier; the conveyors installed under currently operated presses - 2° inclination opposite to belt movement direction*
15	*Overall dimensions of the complete conveyor ready for service length x width x height (mm):*	*acc. to a supplier*
16	*Total weight of the complete conveyor with its drive, ready for service:*	*acc. to a supplier*

17	*Conveyor belt parameters:*	
18	*Belt width (mm):*	*acc. to a supplier; suggested: B = 2000*
19	*Belt length (m):*	*acc. to a supplier*
20	*Belt material:*	*acc. to a supplier; resistant to high temperature:* *continuous duty: up to 50°C* *short time duty: up to 65°C*
21	*Belt tension:*	*Helical*
22	*Belt profile:*	*Flat*
23	*Working belt:*	*Upper*
	Constructional parameters	
24	*Drive drum diameter:*	*acc. to a supplier*
25	*Drive drum type:*	*acc. to a supplier*
26	*Drive drum bearing:*	*Self-aligning ball bearings*
27	*Drive drum bearing mountings:*	*Unsplit*
28	*Reversible drum diameter:*	*acc. to a supplier*
29	*Reversible drum type:*	*Smooth*
30	*Reversible drum bearing:*	*acc. to a supplier*
31	*Reversible drum bearing mountings:*	*Self-aligning ball bearings*
32	*Tension drum diameter:*	*Not applicable*
33	*Tension drum type:*	*Not applicable*
34	*Tension drum bearing:*	*Not applicable*
35	*Tension drum bearing mountings:*	*Not applicable*
36	*Interlocking brake:*	*Yes*
37	*Basic structure material:*	*Carbon steel*

3.4. Medium characteristics

Item	Parameter	Value
1	*Medium:*	*Wet soil lime*
2	*Form:*	*Solid*
3	*Grain size:*	*0÷350 mm*
4	*Bulk density:*	*700 – 800 kg/m^3*
5	*Viscosity:*	*-*
6	*Humidity:*	*max 50%*
7	*Temperature:*	*50 ^{O}C*
8	*Angle of repose (^{O})*	*-*
9	*Corrosive:*	*Yes*
10	*Removable:*	*Yes*
11	*Inflammable:*	*No*

12	*Explosive:*	*No*
13	*Aggregate:*	*Yes*
14	*Pulp:*	*No*
15	*Powdered:*	*No*
16	*Toxic:*	*No*

3.5. Device operating conditions

Item	Parameter	Value
1	*Type of duty:*	*Periodic duty*
2	*Number of cycles per hour*	*acc. to a supplier*
3	*Resistance to moistness:*	*Yes*
4	*Execution for food industry*	*No*

3.6. Available energy-related media

See clause 1.6.

3.7. Equipment required

Item	Parameter	Value
1	*Drive drum shield:*	*Required*
2	*Reversible drum shield:*	*Required*
3	*Tension drum shields:*	*Not applicable*
4	*Runner set shields:*	*Required*
5	*Upper shield of the belt:*	*-*
6	*The remaining shields required for industrial safety:*	*-*
7	*Guides for material handled:*	*acc. to a supplier*
8	*Rubber boards:*	*-*
9	*Charging hopper with a flange*	*-*
10	*Internal scraper:*	*Required*
11	*External scraper:*	*Required*
12	*Emergency stop switches:*	*Cord-type, on both sides of the conveyor*
13	*Movement sensor:*	*Required*
14	*Belt run sensor:*	*2 pcs required*
15	*Earthing:*	*Required*

3.8. Drive

Item	Parameter	Value

1	*Drive type:*	*acc. to a supplier*
2	*Motor type:*	*acc. to a supplier*
3	*Motor manufacturer:*	*acc. to a supplier*
4	*Motor insulation class:*	*acc. to a supplier*
5	*Protection level:*	*IP 55*
6	*Motor assembly type:*	*acc. to a supplier; preferred: on a support*
7	*Cooling type:*	*own*
8	*PTC sensors in the winding:*	*within delivery*
9	*Motor power (kW):*	*acc. to a supplier*
10	*Rotational motor speed (rpm):*	*acc. to a supplier*
11	*Supply voltage (V):*	*400*
12	*Frequency (Hz):*	*50*
13	*Reducer type:*	*acc. to a supplier*
14	*Reducer manufacturer:*	*acc. to a supplier*
15	*Method of installation:*	*acc. to a supplier*
16	*Coupler type:*	*acc. to a supplier*

4. SLUDGE PUMPS – E1.1111D,E

4.1. Intended use and operating conditions

The sludge pumps are used to supply the filter presses E1.1101d,e. The pumps draw thickened sludge from the newly designed tank E1.1010b. The pumps will be located at the dryer building E1.12, in unheated and closed room. On special User's request, consider use of the pumps Warman WAH 6/4.

4.2. General data

Item	Parameter	Value
1	Device name	*Sludge pump*
2	Delivery item	*E1.1111 d,e*
3	Number of pieces	*2*
4	Project number	*Intensification of soda ash production by 200,000 tons/year at Soda Polska Ciech in Inowrocław*

4.3. Required device parameters

Item	Parameter	Value		
1	Device type	*Centrifugal pump*		
2	Drive type:	*Direct, adapted to operate with a frequency converter* [2)]		
3	Net positive suction head for the pump	*max 10 m of column of H_2O*		
4	Available NPSH	*6 m*		
5	Seal type [3)]	*acc. to supplier's experience*		
6	Standards for connection ferrules	*In compliance with EN 1092-1 or DIN*		
7	Material	*acc. to supplier's experience*		
	Values:	*minimum*	*rated*	*maximum*
8	**Capacity [m^3/h]**	*acc. to supplier to guarantee correct operation of the filter presses*		
9	**Pumping head [m]**	*acc. to supplier to guarantee correct operation of the filter presses*		

2) Note: a frequency converter beyond the delivery

4.4. Medium characteristics

See clause 1.4

4.5. Device operating conditions

Item	Parameter	Value
1	Area of installation	*at an unheated building without ventilation*
2	Temperature at the area of installation	*Ambient temperature*
3	Type of duty	*Continuous duty 8600 h/year*
4	Conformity with ATEX	*not required (inexplosive environment)*

4.6. Available energy-related media

See clause 1.6.

4.7. Equipment required

Item	Specification
	Complete pumping engine consisting of:
1	Pump
2	Coupling with a shield
3	Motor (IP55) adapted to be used with an inverter - efficiency class IE3. Additional motor cooling required
4	Clamping and anchor screws
3)	In case of use of a double mechanical seal, the complete tank of barrier liquid shall be equipped among other things with: – a lock tank with a small pump to refill the barrier liquid during the pump operation – a module to measure the level, pressure and temperature of the barrier liquid in the tank, with possibility of transfer the results to the controller – a nitrogen check valve to refill the gas in the tank during pump operation – a stand, necessary pipe connectors and conduits to connect the seal – a complete barrier liquid system must be installed on the pumping engine

4.8. Technical data required for the pumping engine and specified in the offer

Item	Specification
1	Pump name and type
2	Detailed scope of delivery - specification of the individual elements of the pumping engine
3	Hydraulic data of the pump including among other things: – *flow rate*

	– *elevation head* – *efficiency (for ratings)* – *power input* – *pump rpm* – *pump NPSH* – *permissible operating pressure* – *minimum delivery of the pump* – *maximum elevation head at the point "0"*
4	Realization standards including among other things: – *diameters of suction and delivery ferrules* – *rated pressures acc. to PN standard for the above mentioned ferrules* – *rotor diameter*
5	Drive parameters including among other things: – *manufacturer* – *motor size* – *motor power* – *operating frequency* – *supply voltage* – *insulation class* – *efficiency class* – *motor protection* – *temperature sensor*
6	Seal parameters including among other things: – *manufacturer* – *type* – *barrier liquid pressure required* – *volume of barrier liquid in the system* – *barrier liquid type*
7	Constructional materials of individual components of the pumping engine
8	Pump diagram

5. AIR COMPRESSOR – POS. E1.1130A,B

5.1. Intended use and operating conditions

The compressor, pos. E1.1130a,b, is to deliver the air volume required to ensure correct operation of the filter presses E1.1101d,e (clause 1.2.12). The compressors will be installed at the dryer building E1.12, in unheated and closed area.

5.2. General data

Item	Parameter	Value
1	Device name	*Air compressor*
2	Delivery item	*E1.1130 a,b*
3	Number of pieces	*2*
4	Project number	*Intensification of soda ash production by 200,000 tons/year at Soda Polska Ciech in Inowrocław*

5.3. Required device parameters

Compression ratio and output of the compressor shall be selected after the filter press is selected and the press operation cyclogram is specified.

5.4. Medium characteristics

Select a degree of purity and compression for the air to provide correct operation of the filter presses.

5.5. Device operating conditions

Item	Parameter	Value
1	Area of installation	*Inside an unheated building*
2	Temperature at the area of installation	*Ambient temperature*
3	Type of duty	*Continuous duty 8600 h/year*
4	Conformity with ATEX	*not required (inexplosive environment)*

5.6. Available energy-related media

See clause 1.6

5.7. Equipment required

Item	Specification
	Complete compressor system consisting of:
1	Compressor
2	Coupling with a shield
3	Motor (IP55) adapted to be used with an inverter - efficiency class IE3. Additional motor cooling required

4	Clamping and anchor screws

6. COMPRESSED AIR VESSEL – POS. E1.1140A,B

The pressure vessel, E1.1140a,b, is to provide suitable volume of the air for correct operation of the filter presses E1.1101d,e. The vessel size and parameters shall be selected by the supplier. The vessel shall be carried out in compliance with industrial safety standards. The vessel will be installed outdoors.

6.1. General data

Item	Parameter	Value
1	Device name	*Compressed air vessel*
2	Delivery item	*E1.1140 a,b*
3	Number of pieces	*2*
4	Project number	*Intensification of soda ash production by 200,000 tons/year at Soda Polska Ciech in Inowrocław*

6.2. Equipment required

Item	Specification
	Complete system consisting of:
1	Pressure vessel
2	Pressure gauge
3	Safety valves
4	Clamping and anchor screws