

Project: **The construction of CO₂ supercritical
plant extraction research center**

INS/NO-39/2009
Annex No 1

LIST OF EQUIPMENT, MACHINES AND DEVICES TO BE PURCHASED BY INVESTOR

Purchase item	Name	Process item	Pieces	Preliminary technical specification
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Public procurement procedure: **RESTRICTED TENDERING**

11	Carbon dioxide heater 30 MPa	PE1A	1	Shell - and - tube heat exchanger, CO ₂ / steam Shell diameter = 219 mm, length = 3.2 m Design pressure / temperature: 35 MPa / 200 °C; material: 1.4462/1.4541/carbon steel
12	Carbon dioxide heater 7 MPa	PE1B	1	Shell - and - tube heat exchanger, CO ₂ / water Shell diameter = 273 mm, length = 5.2 m Design pressure / temperature: 8 MPa / 100 °C; material: 1.4541/carbon steel
13	Water separation cooler / water separator	PE2A/PS3	1	Shell - and - tube heat exchanger with vessel, CO ₂ / glycol Shell diameter = 324 mm, vessel diameter = 508 mm, length = 5.3 m Design pressure / temperature: 8 MPa / 80 °C; material: 1.4541/carbon steel
14	Carbon dioxide condenser	PE2B	1	Shell - and - tube heat exchanger, CO ₂ / glycol Shell diameter = 356 mm, length = 3.6 m Design pressure / temperature: 8 MPa / 50 °C; material: 1.4541/carbon steel
15	Liquid carbon dioxide cooler	PE3A/B	1	Shell - and - tube heat exchanger, CO ₂ / glycol Shell diameter = 324 mm, length = 4.1 m Design pressure / temperature: 8 MPa / 100 °C; material: 1.4541/carbon steel
16	Carbon dioxide heater 53 MPa	PE4	1	Shell - tube heat exchanger, CO ₂ / steam Shell diameter = 219 mm, length = 3.8 m Design pressure / temperature: 63 MPa / 200 °C; material: 1.4462/1.4541/carbon steel
17	Water cooler	PE5	1	Counter-current heat exchanger, potable water / glycol Cylindrical Surface = 2.1 m ²
18	First fraction separator 30 MPa	PS1	1	Vertical cylindrical vessel with heating jacket Inner diameter = 500 mm, volume = 0,3 m ³ Design pressure / temperature: 35 MPa / 100 °C; material: 1.4541/carbon steel
19	Second fraction separator 7 MPa	PS2	1	Vertical cylindrical vessel with heating jacket Inner diameter = 500 mm, volume = 0.45 m ³ Design pressure / temperature: 8 MPa / 100 °C; material: 1.4541/carbon steel

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20	Liquid carbon dioxide vessel	PZ1	1	Horizontal cylindrical vessel Inner diameter = 1400 mm, volume = 8 m ³ Design pressure / temperature: 8 MPa / 50 °C; material: stainless steel
21	First fraction vessel	PZ3	1	Vertical cylindrical vessel with heating jacket and agitator; equipped with stub pipes for washing nozzles Inner diameter = 1200 mm, volume = 1 m ³ Design pressure / temperature: 0.6 MPa / 100 °C; material: stainless steel
22	Second fraction vessel	PZ4	1	Vertical cylindrical vessel with heating jacket and agitator; equipped with stub pipes for washing nozzles Inner diameter = 1200 mm, volume = 1 m ³ Design pressure / temperature: 0.6 MPa / 100 °C; material: stainless steel
23	Extract vessel	PZ5, PZ6	2	Vertical cylindrical vessel with heating jacket and agitator; equipped with stub pipes for washing nozzles Inner diameter = 1400 mm, volume = 3 m ³ Design pressure / temperature: 0.6 MPa / 100 °C; material: stainless steel
24	Hot water vessel	PZ7	1	Vertical cylindrical tank with internal baffle plate Inner diameter = 1600 mm, volume = 5 m ³ Design pressure / temperature: ambient / 100 °C; material: stainless steel
25	Extraction residue tank	PZ8, PZ9	2	Vertical cylindrical vessel Inner diameter = 2600 mm, volume = 10 m ³ Design pressure / temperature: ambient / 50 °C; material: stainless steel
26	Cooling water head tank	PZ10	1	Vertical cylindrical vessel Inner diameter = 500 mm, volume = 0.16 m ³ Design pressure / temperature: ambient / 25 °C; material: stainless steel
27	Crusher head vessel	PZ11	1	Vertical cylindrical vessel Inner diameter = 1500 mm, volume = 4.5 m ³ Design pressure / temperature: ambient / 50 °C; material: stainless steel
28	Homogenizer	PH1	1	Vertical cylindrical vessel with heating jacket and agitator; equipped with stub pipes for washing nozzles Inner diameter = 790 mm, volume = 0.5 m ³ Design pressure / temperature: 0.17 MPa / 100 °C; material: stainless steel
29	Homogenizer	PH2	1	Vertical cylindrical vessel with heating jacket and agitator; equipped with stub pipes for washing nozzles Inner diameter = 1400 mm, volume = 3 m ³ Design pressure / temperature: 0.17 MPa / 100 °C; material: stainless steel

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30	Catch-drop (inert-gas exhaust)	PS4	1	Vertical cylindrical vessel with heating jacket Inner diameter = 150 mm, volume = 0.01 m ³ Design pressure / temperature: ambient / 50 °C and 0.6 MPa / 100 °C; material: stainless steel
31	Catch-drop (CO ₂ exhaust)	PS5	1	Vertical cylindrical vessel, similar to cyclone design Volume = 0.2 m ³ Design pressure / temperature: ambient / 50 °C
32	Dust extractor	PF1	1	A set combined of cyclone and pulsatory bag filter Negative pressure: up to 40 kPa, explosion-proof and anti-electrostatic design; gas flow rate 1800 m ³ /h Complete set, including control and accessories
33	Liquid carbon dioxide filter	PF2	1	In-line strainer Assignment: filtration of solid particles in plant supply pipeline Design pressure / temperature: 13.5 MPa / 100 °C
34	Cyclone	PC1	1	Vertical cylindrical vessel with tapered bottom Inner diameter = 800 mm, volume = 0.5 m ³ Design pressure / temperature: ambient / 50 °C
35	Centrifuge	PW1	1	Disk-type centrifuge with drive and accessories Assignment: separation of water and particulates from extraction products Capacity: 300 - 600 kg/h
36	Crusher	PGW1	1	Cylinder-type crusher with drive and accessories Assignment: preparation of seeds for extraction process (equivalent grain diameter 0.2-5 mm) Capacity: up to 3000 kg/h
37	Transportation fan	PB1	1	High-pressure radial fan Capacity: 1800 m ³ /h Compression: 10000 Pa
38	Exhaust fan		2	Axial-flow fan Capacity: 12000 m ³ /h Compression: 200 Pa
39	Electrical hoist	PX1	1	Rope electrical hoist Hoisting capacity: 3.2 t

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40	Electronic weigher	PX2	1	Platform weigher with digital read-out Maximum weighing capacity: 1000 kg Weighing accuracy: +/- 1 kg
41	Electronic weigher	PX3	1	Platform weigher with digital read-out Maximum weighing capacity: 2000 kg Weighing accuracy: +/- 1 kg
42	Rotary vane feeder	PDC1, PDC2	2	Rotary vane feeder, type DC, eight vanes with a drive Assignment: vessel gravitational feeding Capacity: 20 m ³ /h
43	Rotary vane feeder	PDC3	1	Rotary vane feeder, type DC, eight vanes with a drive Assignment: vessel gravitational feeding Capacity: 15 m ³ /h
44	Hot water pump	PP2	1	Single-stage impeller pump Capacity: 100 m ³ /h Suction / discharge pressure, temperature: 0.1 MPa / 0.4 MPa , 80 °C
45	Hot water pump	PP3	1	Single-stage impeller pump Capacity: 5 m ³ /h Suction / discharge pressure, temperature: 0.1 MPa / 0.3 MPa , 50 °C
46	Cooling water pump	PP6	1	Single-stage impeller pump Capacity: 3 m ³ /h Suction / discharge pressure, temperature: 0.1 MPa / 0.3 MPa , 10 °C
47	Extract pump	PP8	1	Monolithic centrifugal pump for consumable liquids Capacity: 3.5 m ³ /h Suction / discharge pressure, temperature: 0.1 MPa / 0.3 MPa , 50 °C
48	Air compressor	PA3	1	Piston-type transportable air compressor Capacity: 15 m ³ /h, vessel volume 240 l Operating pressure: 10 bar
49	Bottle filler		1	Complete filling station, including fittings and accessories Capacity: 600 - 2000 cycles per hour; dose 100 - 1000 cm ³ with a double-dosing option Designed for food products

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50	Printer		1	Touchless printer for packaging marking Printing with consumable ink High / number of print lines: 6 - 12 mm / 3 - 5
51	Safety and fire equipment		1	Fire-fighting and safety equipment for the plant according to obligatory regulations
52	Transformer		1	Dry-type transformer Electric power: 1,6 MVA Upper / lower voltage: 6 kV / 0.4 kV
53	Liquid chromatograph		1	Complete package of liquid chromatograph with tandem mass spectrometer LC/MS/MS
54	ASE extractor		1	Automatic extractor. For accelerated extraction of solid and semi-solid samples in high pressure and high temperature conditions. Possibility to use of extraction cells of volume from 1 up to 100 ml.
55	Spectrophotometer		1	Double-beam spectrophotometer UV-Vis. Measuring range from 190 up to 900 nm up to 5Abs. Possibility to measure of spectrum, photometry and reaction kinetics.
56	Laboratory analytical balance		1	Weighing range up to 220 g. Reading accuracy 0.01 mg in weighing range not lower than 60 g
57	General laboratory balance		1	Precise balance with internal calibration (automatic). Weighing range up to 6000 g. Reading accuracy 10 mg in full weighing range.
58	Vacuum evaporator with water bath		1	Laboratory vacuum evaporator with thermostatical water bath. Equipped with a compatible vacuum pump with a vacuum controller.
59	Laboratory dryer		1	Laboratory drier with forced air circulation. Equipped with control system which enable programming of drying process. Maximum working temperature 300 °C.

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60	Ultrasonic bath		1	Thermostatical with time and temperature control. Automatic and manual cycle stop, removable basket. Volume: 5-7 l.
61	Laboratory shaker		1	Horizontal, with replaceable platform and handles. To-and-fro motion, time-lag switch.
62	Crushing mill		1	For breaking up soft, medium hard, crisp and fibrous materials. Exchangeable rotors. Rotor and screens made of titanium, chamber with titanium and niobium lining Very fast and thorough breaking up, including temperature-sensitive materials
63	Homogenizer		1	Capacitive, with exchangeable dispersion tips Adjustable rotation speed, cell volume up to 100 ml Explosion proof design
64	Refractometer		1	Digital, fully automatic measurements with built-in Peltier system. Measurement range: 1.32700 - 1.58000 nD. Measurement accuracy: 0.00001 nD.
65	Fume cupboard		2	Ceramic fume cupboard (1500 mm). Window front panel and ventilated cabinet.