
	KONYA ŞEKER SAN. VE TİC. A.Ş. ÇUMRA ŞEKER ENTEGRE TESİSLERİ – Bioethanol Plant Technical Specification of Superfine Ethanol Production Plant Engineering Design, Procurement, Construction and Commissioning			
	DOCUMENT NO	258000002321	REV. DATE & NO	25.03.2013 / 01
	ORDER NO	2000032131	PAGE NO	1/18
	Prepared by: Bioethanol Production Chief		Confirmed by: Deputy Biotech. Director	

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1. INTRODUCTION

Konya Şeker has identified a need within Turkey for a Superfine Ethanol (SE) Production Plant from Rectified Spirit (RS) of existing fuel ethanol plant.

The plant (hereafter referred to as ‘the Plant’) shall have a nominal Superfine Ethanol (SE) production capacity of 100 KLPD to process 96% v/v ethanol RS but be capable of lower capacity operations efficiently as well, with no change in final quality of the product. The Rectified Spirit which will be used as raw material of the new SE plant shall be hereafter referred as Raw Ethanol (RE). The aim of this document is to describe the general design specifications for the Plant and the technical requirements which the winning bidder (the design and implementing engineering company is hereafter referred to as “the Company”) shall be responsible to complete.


1.1 Key features

The scope of the works for the project will involve overall and detail engineering design, procurement, packaging, shipment, supervision of erection, commissioning and testing of an alcohol rectification plant capable of producing the specified quantity and quality of alcohol from the raw material.

The scope of the works is to include all the equipment necessary to provide the steam and water services and all associated equipment required for the implementation of the project.

The properties of RE (Raw Ethanol) and Superfine Ethanol (SE) are shown in below Tables.-

Parameter	Units	Value	Analysis Method
Alcohol content at 20°C	%vol	Min. 95% v/v	Electronic Density meter
Acidity, as acetic acid	ppm	30	ASTM D-1613
Aldehydes, as acetaldehyde	ppm	1000	GC Method
Methyl Acetate	ppm	50	GC Method
Methanol	ppm	1000	GC Method
Tert Butanol	ppm	25	GC Method
2 Butanol	ppm	60	GC Method
N-propanol	ppm	1500	GC Method
iso butanol	ppm	1300	GC Method
N-butanol	ppm	50	GC Method
Iso-amyl alcohol	ppm	600	GC Method
Evaporation Residue		2.5 dry extract max	Oven Drying Method


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Parameter	Units	Value	Analysis method
Alcohol content at 20°C	% vol	96,3	OIV (Electronic density meter)
Appearance, odor and taste		Courless and clear	EU Standard
pH		6 - 7	EU Standard
Permanganate test	minutes	≥20	EU Standard
Absorbance			
	220 nm	<0,3	EU Standard
	230 nm	<0,18	EU Standard
	240 nm	<0,08	EU Standard
	270 nm	<0,02	EU Standard
Acidity, as acetic acid	ppm	<1	EU Standard
Esters, as ethyl acetate	ppm	<1	EU Standard
Aldehydes, as acetaldehyde	ppm	<1	EU Standard
High alcohols, as isopropyl alcohol	ppm	<2	EU Standard
Methanol	ppm	<10	EU Standard
Ammonia and nitro basis, as nitrogen	ppm	<10	EU Standard
Non volatile residue after evaporation	ppm	<1,5	EU Standard
Furfural	ppm	absent	EU Standard

The plant shall be designed and built as a turn-key project. Apart from execution (erection and site fabrications) works at site all complete engineering, equipment and materials, supervision and training services will be supplied by the Company. The scope of supply is indicated in detail in Appendix 1.

The Plant shall be designed to provide a minimum layout of equipment and piping, with good access to equipment, valves and instruments for operation and maintenance, consistent with minimizing the plant footprint. The platforms, cat ways, stairs and mono ray cranes shall be ideally considered for any sort of maintenance.

All civil engineering drawings and calculations including foundations shall be prepared and given to Konya Şeker to be completed by local contractors.

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1.2 Plant location

The plant shall be located in

Çumra Şeker Entegre Tesisleri,

Biyoetanol Fabrikası ÇUMRA / KONYA / TURKEY.

It shall be attached to existing distillation unit and RE will be supplied to ISBL through a line


1.3 Rules, codes & standards

The Plant design, construction, testing, commissioning, operation and maintenance shall be in compliance with all applicable European directives. All vessels and pressurized equipments shall be designed complying with PED Directive. During and after fabrication of the equipments they shall be tested and confirmed by a third party, who would be determined by taking written approval of Konya Şeker. All piping (& fittings) and wiring materials shall be in European standards. If any equipment has an ANSI/ASME standard connection, they shall be converted into DIN norms with extra assembling parts.

1.4 System of units

The hereafter selected SI units will be preferred. They shall be used in all documents, drawings and specifications.

Flow, m ³ /h, ton/h, l/h	Velocity m/s
Water, m ³ /h	Area m ²
Steam, t/h	Heat kcal, Gcal
Composition	Viscosity kg/m/h or cPoise or cStoke
Products. % w/w, % vol, % mol.	Concentration % wt, mg/l
Impurities, % wt, ppm vol. , ppm mol. , ppm wt	Electrical conductivity mS/cm, mS/cm
Pressure, Process bar abs, Design bar gauge	Piping " inch"
Pressure drop/vacuum, Mbar	Length m
Temperature, ° C	Time s
Duty, kcal/h, Gcal/h, MW	Electrical intensity A
Low Heating Value, MJ/Nm ³ , kcal/kg	Energy Gcal or Kcal or cal
Power, kW	Force, weight N
Enthalpy, kJ/kg, kcal/kg, kcal/Nm ³	Heat transfer coef W/m ² /°C
Weight, kg, ton	Stress and constraint MPa
Volume, m ³ , dm ³ , cm ³ , Liters	Torque N.m
Density, ton/m ³	Illumination lx

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2 DESIGN BASIS

Raw Ethanol to the new unit will be supplied either from the storage tanks or rectifier column. With internal heat integration and minimum consumptions (steam, power, water) and losses (technical alcohol, fusel, evaporation) the desired product shall be produced. Two options shall be taken into account


2.1 Performance characteristics

- The Following Simple Material Balance Table for Conversion, Consumption and Waste Amounts shall be filled.

Table 3.

CONVERSION FIGURES	
	per 100 KLPD SE Production
RE Amount	
Technical Ethanol (TE)	
Fusel Oil	
Evaporation Loss	
CONSUMPTION FIGURES FOR UTILITIES	
Steam (*) (ton/h)	
Power (kW)	
Cooling Water (m ³ /h) & Delta T	
Soft Water (m ³ /h)	
Process Water (m ³ /h)	
WASTE WATER	
Drained Spent Lees (m ³ /h)	
Recycled Spent Lees (m ³ /h)	

(*) 6 barg steam pressure shall be available at OSBL. If lower pressure is required, the Company shall install PRS system for Pressure Reduction

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2.2 Completion & Commissioning

Starting with the signature of the agreement date, The Plant shall be completed and commissioned in 10 months.

A rough schedule shall be given in the quotation. After signing the contract a detailed schedule shall be given to Konya Seker in a week for confirmation

2.3 Performance Tests

72 hours continuous Performance Test shall be carried out to ensure the plant's performance and guarantee parameters.

2.4 Site design basis

2.4.1 Site and geographical conditions,

The design of the Plant will be in accordance with the following site conditions:

Altitude: 1013m

Atmospheric temperature: Dry Bulb Maximum 40° C

Dry Bulb Minimum -25° C

Wet Bulb Maximum 22°C

Blower Skid Plan Dimensions (max): Supplier to advise maximum requirement

Earthquake's risks according to UBC: Zone 0


Prevailing wind direction: N

Maximum wind speed: 36 m/s maxi for design

2.4.2 Design and manufacturing codes,

All design and manufacturing codes applicable to the Plant shall be agreed between the Supplier and Konya Seker, in particular with reference to the following:

- Pressure vessels
- Piping
- Machines
- Electrical

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2.4.3 Equipment, process and utility interfaces,

The Plant shall comprise all equipment necessary to process the Raw Ethanol into the final product Superfine Ethanol (SE) including but not limited to the following:

All columns, heat exchangers, circulation lines, pumps, motors, all electrical & instrumental parts and others should be designed and selected considering highly flammable streams to run the plant without any problem. Similarly all the long term measures should be taken not to have any intolerable impurity or smell in the final product.


2.4.4. Engineering and Erection Phases

All drawings shall be in the AUTOCAD form and they shall be submitted to Konya Seker in AUTOCAD form unless otherwise is requested.

All safety precautions shall be taken and advised by the supervisors of the Company.

Overall detailed project schedule shall be prepared and submitted to Konya Seker. Daily, weekly and monthly progress reports shall be prepared by the Company indicating deviations from the schedule. These reports shall be submitted to Konya Seker regularly and promptly.

Supervisors' travel date shall be arranged asking Konya Seker. Without a joint decision of both companies they will not leave or come. All supervisors shall be ready to stay in the Guesthouse of Cumra Seker, to work in shifts, overtimes if required and asked by Konya Seker.

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2.4.5. Scope of Supplies and Specifications of Bought Out

Below Tables indicates the scope of supplies and accepted brands & types for bought outs. For any different type and makes, the Company shall ask the confirmation from Konya Seker. If the Company procures any material apart from this list or unconfirmed material, the Company shall change with the confirmed one by Konya Seker

1. CIVIL PART	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning
Foundation	Company	KS	KS	KS
Building (Architectural Design)	Company	KS	KS	KS
Structure	Company	KS	KS	KS
Support	Company	KS	KS	KS
illuminating (Exproof)	Company	KS	KS	KS
Earthing	Company	KS	KS	KS
Layouts	Company	NA	NA	NA
Structure and Support Parts Drawings	Company	NA	NA	NA
BOQ of Steel Structural parts	Company	KS	KS	NA
Structure and Support Parts Fabrication	NA	KS	KS	KS


Based on detailed engineering and drawings supplied by the Company materials shall be procured by KS and fabrications of steel structures shall be completed by KS. BOQ and types of the steels shall be specified by the Company to be base for fabrication by KS.

2. CRITICAL EQUIPMENTS	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning	Standards
Process Tanks	Company	Company	KS	Company	EU PED - CE Certified
Distillation Columns	Company	Company	KS	Company	EU PED - CE Certified
Shell & Tube Heat Exchangers	Company	Company	KS	Company	EU PED - CE Certified
Fusel Decanter	Company	Company	KS	Company	EU PED - CE Certified
Cu Reactor	Company	Company	KS	Company	EU PED - CE Certified

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3. PIPING	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning
Piping and Fittings	Company	KS	KS	Company
BOQ List	Company	NA	KS	Company
Piping General Arrangement Design	Company	NA	NA	Company
Piping Isometrics	Company	NA	NA	Company
All piping materials shall be complied with DIN (EU) standards. ASTM norms shall not be accepted.				

4. MECHANICAL BOUGHT OUTS	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning	Type	Brand/Make
Plate Heat Exchangers	Company	Company	KS	Company	-	Alfa Laval
Centrifuge Pumps with Exproof Motors	Company	Company	KS	Company		Sulzer
Vacuum Pumps	Company	Company	KS	Company	Liquid Ring	Nash Elmo
Type of seals for the centrifuge pumps	Company	Company	KS	Company	API Seal 11	John Crane or Eagle Burgmann
All Centrifugal and Vacuum Pumps shall be procured with stand by (1+1) The capacities and motor loads of all pumps shall be mentioned in the quotation						


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5. ELECTRICAL WORKS	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning	Brand/Make - Type
MCC Panels	Company	Company	KS	Company	SIEMENS SIVACON communication modular type
Cabling	Company	Company	KS	Company	NYRY 0.6 / 1 kV PVC insulated steel wire armoured multi-core cable
Cable Trays	Company	Company	KS	Company	Galvanised steel.
Motors	Company	Company	KS	Company	Siemens / ABB
Motor starters	Company	Company	KS	Company	Schneider / Siemens / ABB
Motor Control boxes at site near motors	Company	Company	KS	Company	Local/Remote switch without lamp
Motor Protections	Company	Company	KS	Company	Programmable Protection Relay (Simecode)
Circuit breakers	Company	Company	KS	Company	Schneider / Siemens / ABB
Contactors	Company	Company	KS	Company	Schneider / Siemens / ABB
Switches	Company	Company	KS	Company	Schneider / Siemens / ABB
Relays/Aux. relays	Company	Company	KS	Company	Schneider / Siemens / ABB
Terminal strips	Company	Company	KS	Company	Phoenix / Weidmüller
Lamps	Company	Company	KS	Company	Schneider / Siemens / ABB
Push buttons	Company	Company	KS	Company	Schneider / Siemens / ABB
Timers	Company	Company	KS	Company	Schneider / Siemens / ABB

MCC panels shall be located into existing MCC room of bioethanol plant (Fermentation Building). MCC panel sizes shall be mentioned in the quotation.

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6. INSTRUMENTAL WORKS	Design & Engineering	Material Supply	Erection and Site Works	Supervision for erection & commissioning	Brand/Make
Cabling	Company	Company	KS	Company	ASI Cable shall not be used
Flow meters	Company	Company	KS	Company	E+H , Siemens, ABB
Temperature switches	Company	Company	KS	Company	E+H , Siemens, ABB
Pressure switches	Company	Company	KS	Company	E+H , Siemens, ABB
Temperature transmitters	Company	Company	KS	Company	E+H , Siemens, ABB
Pressure transmitters	Company	Company	KS	Company	E+H , Siemens, ABB
Flow transmitters	Company	Company	KS	Company	E+H , Siemens, ABB
Level transmitters	Company	Company	KS	Company	E+H , Siemens, ABB
On/off Level Sensors	Company	Company	KS	Company	E+H , Siemens, ABB
Control Valves	Company	Company	KS	Company	Samson, E+H , Siemens, ABB
On/Off automatic Valves	Company	Company	KS	Company	Tyco E+H , Siemens, ABB,

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2.4.6 Instrumentation & Integration of Automation to existing system

Automation:


The existing system is Honeywell EPKS R400 and the new system shall be integrated to this existing system. The new DCS system is not needed to be procured by the Company. Addition of a redundant C200 Controller is required. Considering the I/O numbers, newly projected I/O interface cards shall be added by the Company and 20% spare shall be taken into account for addition of I/O cards. The selected I/O cards shall be approved by the automation department of KS. Depending on the distance, remote I/O can be used if needed. Based on the I/O number license registration and softwares for virus and point licenses shall be scope of the Company. An additional server is not needed. However, client having double monitors shall be added by the Company. Related reporting shall be prepared by the supervision of Konya Seker process engineers. The existing printer can be used for reports and print-screens. There should not be any locked module like CM, SCM, ...etc. Overall system shall be open to be operated by Konya Seker and changed if needed. All Functional Logic Diagrams, Operating Manuals and the latest versions of I/O lists shall be accessible from DCS.

Instrumentation:

Before procurement, makes and types of all instruments shall be submitted for the confirmation by Konya Seker Automation Department. ASI and Profibus communication protocols shall not be used for instruments. Instead of Profibus communication Hard protocols shall be preferred.

Cabling:

Junction Box project, cable tray routes, the detailed form of I/O lists and cable selection shall be submitted to Konya Seker for confirmation. All site and panel labelling shall be complied with the latest and confirmed project. Labelling on instruments should be on metal plates, for panels and cables they should be in permanent form. Signal and power cables should be laid on separate trays.

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2.4.7. Electrical Designs and Works

Frequency Converters:

Frequency Convertors should be used for all pump and fan motors applications. It will be selected from new generation drivers of Siemens or ABB brand.

In give way systems which do not require speed control;

- Direct give way Simocode
- Y/Δ motor Simocode
- Soft Starter motor Simocode, will be used.

Communication:

Communication in soft starter give way shall be done from over simocode instead of soft starter. Protection devices in all MCC systems shall be communicated with Profibus. All energy analysers, especially on ADP, will be processed together with Profibus. Control elements connected to MCC will have Local – Remote control as Green for Start and Red for Stop.


Lighting:

All of armatures will be selected from highest efficiency types regardless of elevated or low ceiling. Fluorescents will be electronic ballast type. Led lighting can not be used unless plant management.

Panels:

ADP panels will be Plug-in type having form 2B standard.

Modular type combinations will be used for MCC panels. Siemens Sivacon series can be selected. (Note that maximum height is 2,20 meters)

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Motors:

ABB and/or Siemens motors shall be selected.

All motors shall be complied with ATEX standards to enable an exproof media.


The motor efficiencies shall be either IE2 or IE3 grades. Technical files shall be submitted for electrical motors in one month after kick off meeting. Technical files for electrical motors must include below data;

1. Numerical values for efficiency (η) at full rated power and voltage (U_N), 75% rated power and voltage, 50% rated power and voltage
2. Efficiency level : “ IE2 ” or “ IE3 “
3. Manufacturing year
4. Manufacturer name and trade mark, trade registration number and place
5. Product code number
6. Number of pole of motor
7. Rated output power(s) or rated output power interval (kW)
8. Rated input frequency/frequencies of motor (Hz)
9. Rated voltage(s) or rated voltage interval (V)
10. Rated speed(s) or rated speed interval (rpm)
11. Information about recycling, disposal and uninstal methods
12. Design Data
 - (i) Altitude from sea level
 - (ii) Medium air temperature also included for air cooled motors
 - (iii) Cooling water temperature at product inlet point
 - (iv) Maximum working temperature
 - (v) Potential explosive mediums

At least 1st, 2nd and 3rd items should be given on motor labels. If an electrical motor working with frequency converter is needed then precautions of preventing electrical and magnetic areas sourced from frequency convertor and special information for maintenance and usage in technical file.

Cables:

Control cables will be selected from LAPP – Birtaş, 0,6/1 kV NYY kablolar HES – PRYSMIAN – NEXANS, OG XLPE brands and electrical cables from HES – PRYSMIAN – NEXANS

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Cable Channels:

Ladder type for vertical places and channel type for horizontal places shall be used. All cable supports will be in hot immersed galvanize being heavy service form. All console and I80 profile connecting and intermediate elements will be hot immersed galvanize material. Camber head bolts will be selected. Cover will be certainly used for protecting of cables in all ladder and channel type cable supports. Cable channels will not be processed unless closing the covers.

Ex-Proof:


Equipments and materials such as lighting armatures, panels, control boxes, motors and gear boxes which will be needed to use in ex-proof areas should be EX-PROOF certified. Cables will have steel guard. Material selection and projects will be selected and done according to existing legal notifications and regulations. All of above will be approved by Konya Seker authorizes.

Fire Detection And Caution Systems:

Fire sensation and caution system design and material selection will be done based on related legal regulations. Material list and project drawings in dwg format will be approved by Konya Seker authorities

Others:

(Weak current / Strong current) All projects in dwg form and including material lists will be submitted to Konya Seker authorities and it will be processed after confirmation.


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3 INFORMATION TO BE PROVIDED BY SUPPLIER

3.1 Information with the offer

The following information shall be provided at the time of submission of the Offer:

- Codes and standards for pressure vessels, piping, electrical installation and instrumentation
- Process Flow Diagram (PFD) and the related process description with min./max. flows, pressures and temperatures for main plant sections
- Preliminary Process and Instrumentation Diagram
- Preliminary control architecture
- Lay out and area requirements
- Composition and flow of vents and liquid effluents
- Equipment vendor list
- List of references
- Delivery schedule for technical data (see section 4.2 below) and equipment
- Projected duration of commissioning / start-up
- Price list of spare parts, for two years of operation
- Main items of plant maintenance program over first 10 years of operation
- Description of inspections and tests performed on equipment before shipment
- Supplier specification of hot and cold insulation (with type, densities and thickness, where applicable) of all materials including outer cladding components
- Supplier specification of anti-corrosion and painting systems
- Supplier specification of internal cleaning of systems. (CIP)
- Equipment and piping material specifications of the plant cold end
- List of internal standards and procedures applied by supplier for plant design, manufacturing, inspection and documentation

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3.2 Contractual documentation

All documentation and drawings shall be provided in English or Turkish and be available in digital form (drawings in AUTOCAD).


A schedule of provision of all plant documentation shall be agreed between Konya Seker and the selected supplier prior to contract signature.

Three paper copies of final plant documentation, as well as two copies on CD ROM, shall be provided.

The DCS and Supervision program files shall be provided on CD ROM.

The technical documentation shall in particular include the following (this list is not exhaustive):

- Instructions for plant erection
- Instruction for plant start-up
- Plant maintenance manual
- Plant operation manual.
- Logic diagrams
- Description of Running Sequence, detailing steps and conditional outcomes, as viewed from the plant operator, for cold and warm start-up, shut down, load increase or decrease.
- Flow Diagram with Material Balance Data
- P & I Diagrams
- General Arrangement Drawings
- Architectural and Steelwork Arrangement Drawings
- Civil Calculations and Drawings
- Foundation Drawings
- Vessel & Heat Exchanger Data Sheets
- Piping Drawings
- Insulation Specification
- Commissioning Plan
- Mechanical Insulation Specification
- Operating & Maintenance Manuel, Full Technical Specification
- Motor Schedule
- Power Electrics & Instrument Electrics Design
- Control Philosophy Document
- Loop Diagrams, Hook Up Diagrams

	KONYA ŞEKER SAN. VE TİC. A.Ş. ÇUMRA ŞEKER ENTEGRE TESİSLERİ – Bioethanol Plant Technical Specification of Superfine Ethanol Production Plant Engineering Design, Procurement, Construction and Commissioning			
	DOCUMENT NO	258000002321	REV. DATE & NO	25.03.2013 / 01
	ORDER NO	2000032131	PAGE NO	18/18
	Prepared by: Bioethanol Production Chief		Confirmed by: Deputy Biotech. Director	

All drawings will be AutoCAD generated & will be available on CD-ROM/DVD. Other documentation will be Microsoft Excel or Word generated. All the above documentation will be transmitted by email.

Manuals shall be provided in the English / Turkish language.

The Company shall also provide within a final dossier including:

- the certificates of materials
- the certificates of qualification of the welders
- the reports of the non-destructive tests performed
- the certificates of the pressure tests performed
- the certificates of construction and inspection of the main components
- the certificates of compliance to applicable European norms of the equipment.