



Techinservice
GROUP

TEEU

BIOETHANOL PRODUCTION TECHNOLOGY



■ PROPRIETARY TECHNOLOGY OVERVIEW

TEEU™ - Techinservice Exclusive Energy Using

The energy-efficient bioethanol production technology is Techinservice's proprietary technology designed to significantly reduce thermal energy consumption and simplify the distillation process.

REDUCTION IN STEAM CONSUMPTION*



**Conventional technology
steam consumption**

1.70 kg of steam / l bioethanol



74% reduction



TEEU™ steam consumption

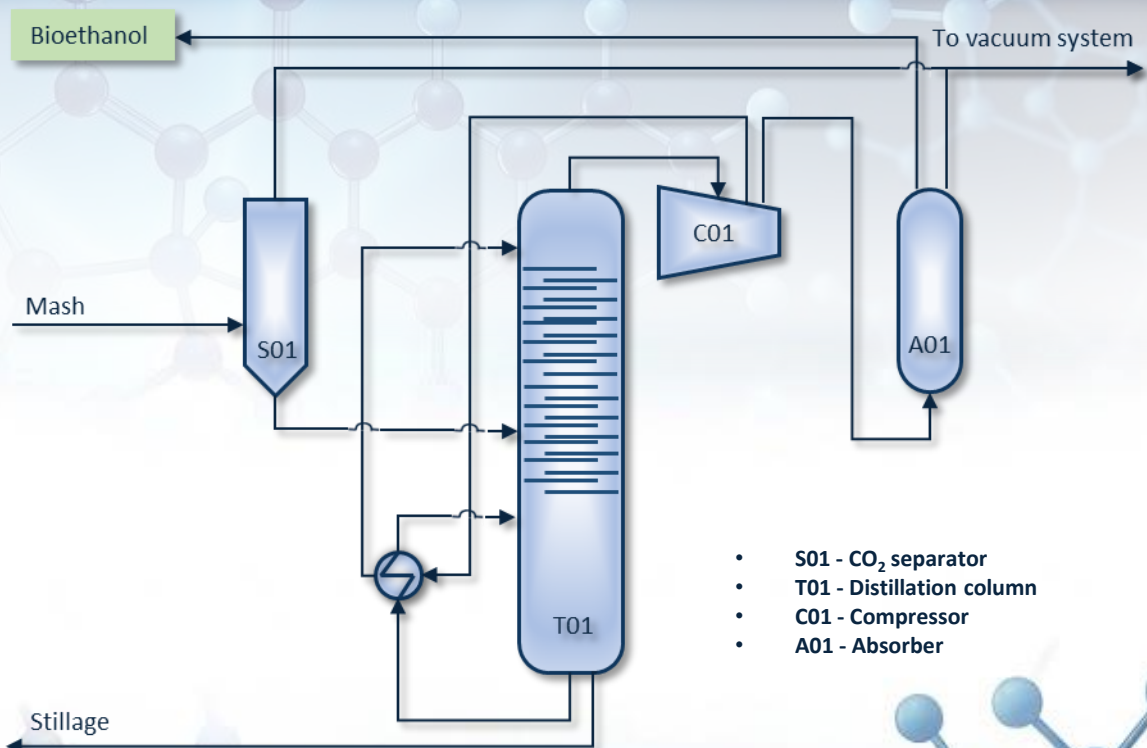
0.45 kg of steam / l bioethanol

*TEEU™ technology shifts a portion of the process energy demand from steam to electricity, resulting in higher electricity consumption while reducing steam consumption.



■ TEEU™ PROCESS

The key innovation of TEEU™ is the compression and thermal reuse of ethanol vapour within the distillation process.



The compressor increase the pressure of the ethanol vapour from 1.15 to 4.8 bar(a) while simultaneously raising its temperature from 90°C to 171°C, operating on the principle of a heat pump and enabling the recovered heat to be effectively utilized for heating process streams.



■ BIOETHANOL QUALITY. TEEU™ TECHNOLOGY

Property Unit	Value	Test method	Application
Ethanol, including higher saturated alcohols content, % (m/m), min	98,7	EN 15721	A component of motor fuel. Feedstock for chemicals synthesis
Higher saturated (C3-C5) mono-alcohols content, % (m/m), max	2,0	EN 15721	
Methanol content, % (m/m), max	1,0	EN 15721	
Water content, % (m/m), max	0,300	EN 15489, EN 15692	
Total acidity (expressed as acetic acid), % (m/m), max	0,007	EN 15491	
Electrical conductivity, μS/cm, max	2,5	EN 15938	
Appearance	Clear and colorless	EN 15769	
Inorganic chloride content, mg/kg, max	1,5	EN 15484, EN 15492	
Sulfate content, mg/kg, max	3,0	EN 15492	
Copper content, mg/kg, max	0,100	EN 15488, EN 15837	
Phosphorus content, mg/kg, max	0,15	EN 15487, EN 15837	
Involatile material content, Mg/100 ml, max	10	EN 15691	
Sulfur content, mg/kg, max	10,0	EN 15485, EN 15486, EN 15837	



■ TEEU™ KEY ADVANTAGES



ECONOMIC & LOW-CARBON

TEEU™ is particularly advantageous where electricity is competitively priced and fossil fuel costs are high. By shifting part of the process energy demand from steam to electricity, TEEU™ reduces reliance on fossil fuels and improves overall project efficiency.

When powered by renewable electricity, TEEU™ enables the production of a lower-carbon and sustainable bioethanol.



LOWER ENERGY CONSUMPTION

TEEU™ achieves exceptionally low steam consumption of only 0.45 kg/L of bioethanol, compared with approximately 1.70 kg/L in conventional technologies. It allows a reduction of around 74%.

The simplified process configuration, with fewer equipment units and pumps, further reduces electrical energy consumption and overall utility demand.



INSTALLATION AND MAINTENANCE

TEEU™ utilizes a single integrated tray column. Fewer process equipment units, pumps, instrumentation, automation devices and control valves result in a simpler plant configuration and reduced installation and maintenance requirements.



PROCESS FULL AUTOMATION

The production process is fully automated, providing seamless technological operation and stage-by-stage process control through the automated control system.

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