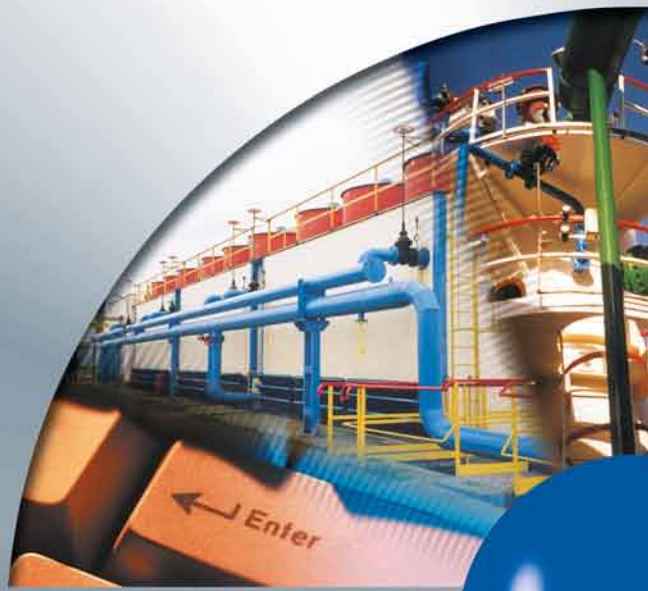
INTEGRATED SOLUTIONS
FOR SUGAR PLANT
CONSTRUCTION &
MODERNIZATION

HEAT AND MASS TRANSFER EQUIPMENT

GREBENKY™
MACHINE-BUILDING PLANT

References:

UKRAINE	Volodymyr-Volynsky Sugar Plant, Gaisyn Sugar Plant, Naumivka Ethanol Plant, Babyno-Tomakhivsk Sugar Plant, Ivashky Ethanol Plant, Trylisy Ethanol Plant, Korostyshiv Ethanol Plant
RUSSIA	Olhovatsky Sugar Factory, Nikiforovsky Sugar Plant, Zherdevka Sugar Plant
BELARUS	Skidel Sugar Factory
BULGARIA	Stara Zagora
KYRGYZSTAN	Kaindy-Kant Sugar Plant
GERMANY	Nordzucker Group



Techinservice™

HEAT AND MASS TRANSFER EQUIPMENT

MODERN VACUUM CONDENSING UNITS OF SUGAR PLANTS

Vacuum condensing units (VCU) are designed for maintaining a constant operating pressure in the sugar factory's vacuum system.

Techinservice designs and constructs VCU equipment and schemes providing all the advantages in condenser design.

The **Techinservice** vacuum condensing units include the following equipment:

- raw juice heaters (surface condensers);
- condensers;
- cooling towers;
- VCU automatic control system.

Vacuum Condensing Unit at Volodymyr-Volynsky Sugar Plant

RAW JUICE HEATERS (SURFACE CONDENSERS)

The VCU has two groups of heaters for heating raw juice with crystallization vapors, namely:

1st group – B and C product crystallization vapors;

2nd group – A product crystallization vapors and secondary steam from the last effect of evaporation station.

Vapor is fed into the shell section of the heater, where some of this vapor is condensed. Raw juice is heated nearly up to the condensable vapor temperature of Δt = 1-2 °C. This allows using secondary energy resources more effectively and reducing the exhaust steam consumption necessary for production of sugar. The pressure drop in the heater as well as in the VCU scheme developed by **Techinservic**e is compensated in the condenser designed by **Techinservice** (the pressure drop in the steam flow does not exceed 1.5 kPa).

Such design solution allows:

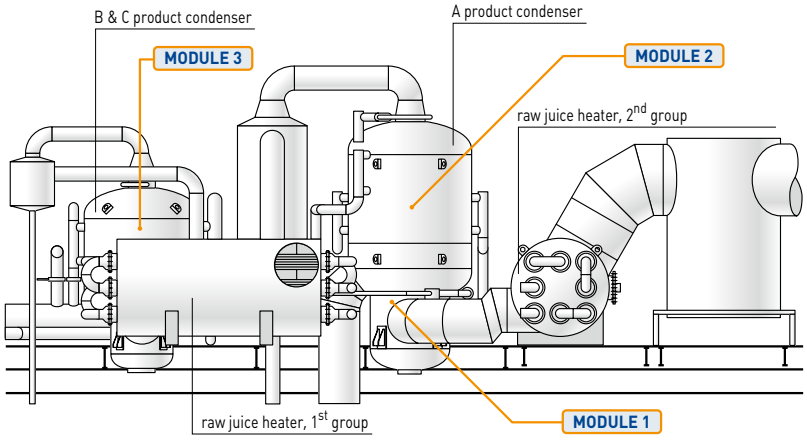
- using the total volume of crystallization vapors to be condensed for heating raw juice;
- maintaining a constant operating pressure in the sugar factory's vacuum system;
- decreasing the flow rate of vapor fed into the condenser by the flow rate of vapor condensed in the heater;
- reducing the cooling water consumption.

Shipment of Raw Juice Heater at Grebinky Machine-Building Plant

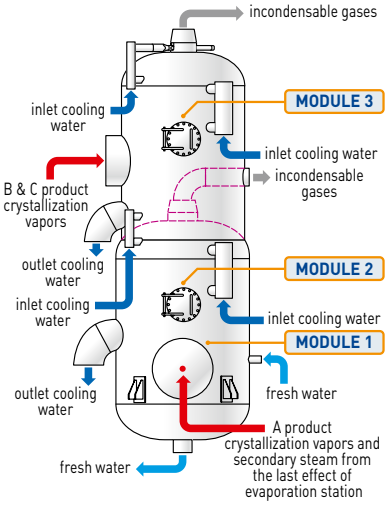
Operating parameters of the raw juice heater installed at the **Nordzucker AG** sugar plant: 850 m^3 of juice per hour is heated from 18 up to 40 °C with crystallization vapors having the temperature of 53 °C. And the vapor flow rate condensed is 37 t/h.

Raw Juice Heater Mounted
at the Uelzen Nordzucker Refinery

Vacuum Condensing Unit (Horizontal Arrangement)



Vacuum Condensing Unit (Vertical Arrangement)



CONDENSERS

The condensers constructed by **Techinservice** are based on the principle of intensive mass heat exchange achieved due to fine liquid atomization.

Main technical and economic features of **Techinservice** condensers:

- pressure drop in the steam flow does not exceed 1.5 kPa (150 mm w.g.);
- possibility to heat process water nearly up to the condensable vapor saturation temperature ($\Delta t_{subcooling\ 1}$ = 0.3-0.7 °C);
- possibility to heat cooling water in the condensation zone of bulk vapor ($\Delta t_{subcooling\ 2}$ = 0.7-2.5 °C);
- reliable operation and hydrodynamic stability;
- lower content of metal in structure.

The performance of these condensers is not affected by sharp fluctuations of the vapor flow rate as well as the cooling water temperature. These condensers' advantages are the result of their original structural design.

3-D Model of VCU for Buinsky Sugar Plant

The Techinservice condensers can be manufactured in a vertical or horizontal design:

MODULE 1

for heating fresh water required for process needs

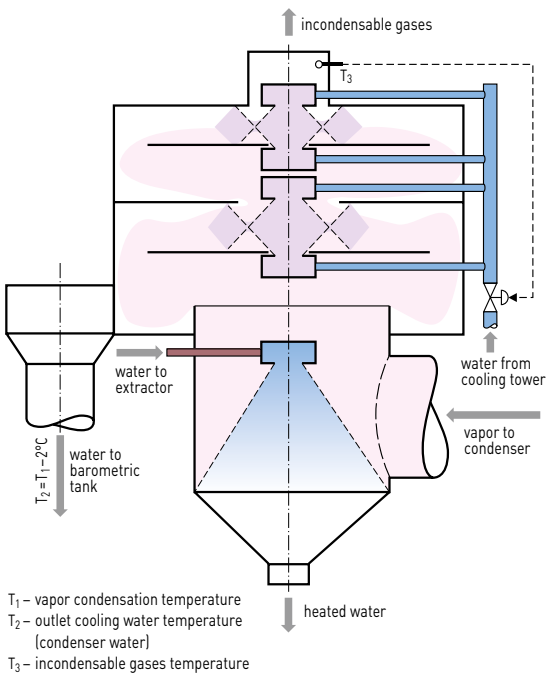
MODULE 2

for maintaining vacuum in A-product vacuum pans at 0.8-0.84 kg/cm^2

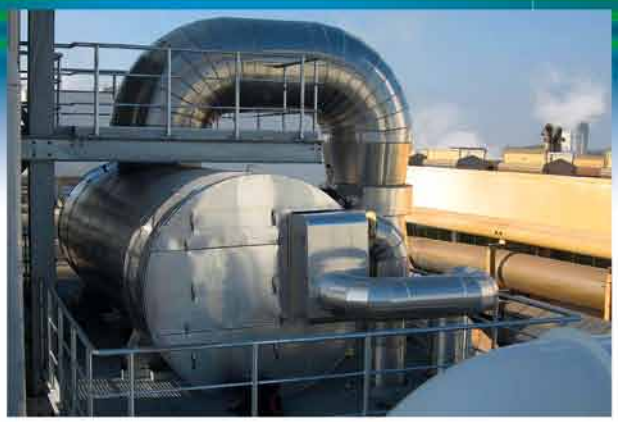
MODULE 3

for maintaining vacuum in B & C-product vacuum pans at 0.9-0.99 kg/cm^2

Condenser Schematic Diagram

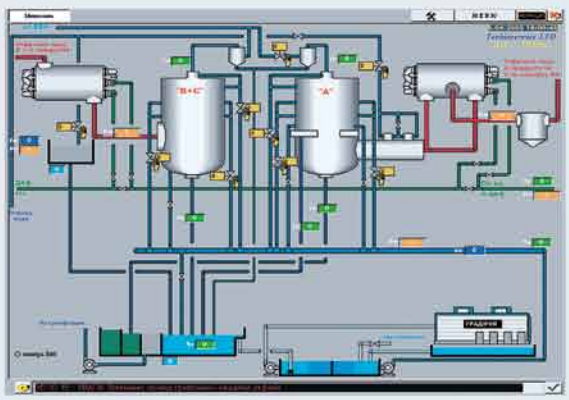


HEAT AND MASS TRANSFER EQUIPMENT



Raw Juice Heater (PDU) at Clauen Nordzucker Sugar Plant

Control System Mnemonic Diagram



VCU Technical Specification		
Model	Capacity on condensable vapour, t/hour	Pressure drop, mm w.g.
K-6	6	153
K-17	17	
K-20	20	
K-20M1	20	
K-25	25	
K-45	45	
K-50	50	
K-60	60	
K-75	75	
S-6	6	
S-10	10	
S-12	12	
S-25	25	
S-30	30	
S-35	35	
S-40	40	
TKK-3.5 (combined A and B+C products)	AA product – 25 t/h, B+C products – 10 t/h	
TKK-6 (combined A and B+C products)	A product – 40 t/h, B+C products – 15 t/h	
TKC-1A	0.02	
TKC-3A	0.025	
TKC-4	4	
TKC-5	5	
TKC-20	20	
TKC-40	40	

AUTOMATIC CONTROL SYSTEM

The main feature of the vacuum condensing unit control system is the use of several valves feeding water to the condenser, which open/close depending on the vacuum level as well as the temperature of incondensable gases and outlet cooling water, which allows minimizing the cooling water consumption.

If the VCU control system is used simultaneously with the sugar end control system, when a vacuum pan is started or stopped, the water feed is automatically changed slightly for preventative adjustment of vacuum in the collector.

VCU Operation Field Case		
Parameter	2nd Group Heater + A-Product Condenser	1st Group Heater + B&C-Product Condenser
Vapor flow rate, t/h	20÷75	7÷20
Absolute vapor pressure, MPa	0.02÷0.017	0.01÷0.014
Inlet fresh water temperature, °C	4÷20	–
Inlet raw juice temperature, °C	43	27
Outlet raw juice temperature, °C	58÷59	43
Outlet fresh water, °C	58÷60	–
Inlet cooling temperature, °C	30	30
Incondensable gases temperature, °C	32	32
Pressure drop in the steam flow, kPa	not more than 1.5	not more than 1.5

Techinservice™
www.techinservice.net

UKRAINE
1, Makiivskyy Provulok, Kyiv, 04114
Tel./fax: (+38 044) 468 93 11, 464 17 13
e-mail: net@techinservice.com.ua

RUSSIA
1, Marksistskaya Str., Moscow, 109147
Tel.: (+7 495) 937 79 80, fax: (+7 495) 937 79 81
e-mail: info@techinservice.ru