OIL REFINING PLANT “STREAM–21”

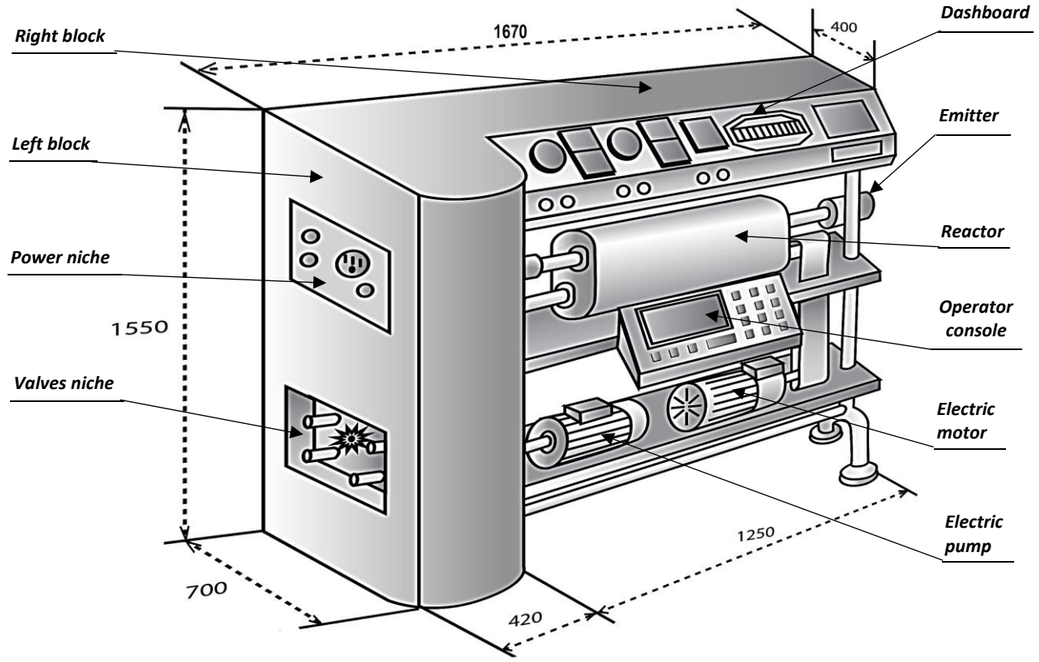

Fig. 1. The design of the plant "Stream - 21"

The plant is designed as a combination of two blocks (Left and Right). The Right block contains the instrument assemblies at two levels. The dashboard, located on the top right, includes the measuring instruments of the Monitoring system. Under the dashboard there is a lower level of the plant: the table where a reactor is mounted.

The Reactor is a hollow structure, which contains inside the devices for execution of reaction of cavitation hydrogenation of dehydrated raw material and a generator of atomic hydrogen.
The reactor is equipped with the necessary number of fittings and hydraulic valves to connect with other equipment. Two ultrasonic emitters are installed inside the reactor. Technological modes of conversion of oils of different genesis are adjusted by means of Operator console. It is located in front of the reactor next to the reactor table.

An Equipment built in the Left block ensures uninterrupted, continuous operation of the plant. It contains filters, mixers, flowmeters, and piping systems. There are two niches on the front side of the Left block. A socket for connection of the plant into the power circuit and switches for power supply of two electric motors and the system of emitters are installed in the upper niche. The lower niche contains valves for connection of the plant to inlet lines: raw material and fueling gas and two valves for connection of the plant to outlet lines for gas residues and evacuation of processed products.

TECHNICAL DOCUMENTATION

The technical documentation included into delivery set contains: Engineering Specification (ES), Technical Assignment (TA), Technical Passport (TP).

WARRANTY

The guarantee service is provided by manufacturer of the equipment during 24 months as of the final date of the workshop testing of the plant.

MANUFACTURER DETAILS

Petroleum Institute of UAS. Ukraine, Kiev, Semashko St., 15.
Phone: +380 (99) 4022727; +380 (93) 1543109
e-mail: voyinstitut@meta.ua info@oil-institute.com
Web: www.oil-institute.com

TECHNICAL CHARACTERISTICS

Name and unit of measurement	STREAM-21 (2.0 m³/hour)
Plant Dimensions. (length x width x height), mm	1670 x 1550 x 700
Plant total weight, kg	260
Productivity of the plant, L/min	20.0 – 22.0
Productivity, m³/hour	**2.0 -2.15**
Operating pressure in reactor, MPa	0.09 – 0.18
Operating temperature of reactor (°C)	30-50
Electric power consumption (kw/hour)	**10.0**
Gas consumption, m³/hour	**1.0 – 4.0**
Efficiency of atomic hydrogen generator, relative units	**0.93 – 0.95**
Acoustic power of emitters (kw)	2 × 3.0
Operated parameters in “Monitoring” system	Temperature, pressure, radiation power, consumption of raw material, gas and products
Control and administration system of mechano-acoustic fields	Manual/automatic, 2 processors based on PXI – technology
Raw material:	Crude oil, high-viscosity oil, fuel oil M100
Final products of processing	Mix of fuels
Mode of operation and service staff	Continuous, cyclic, 1 operator

FUNCTION OF THE PLANT

The plant implements **Cavitation Hydrogenation technology**. Conversion of heavy raw hydrocarbons is carried out by using active "fast" particles. Such particles (hydride radicals or alkyl radicals) saturate the liquid feed in the cavitation area. Cavitation is just an auxiliary (secondary) process. In this way, the depth of processing is increased while power consumption is substantially reduced. The plant is designed for industrial use. It should be installed in the closed premises (in a ventilated container or closed box). The plant processes **degassed, dehydrated and desalted**, prepared oil in the amount of 50 cubic meters per day. Since oil is extracted from different underground reservoirs the processing operation modes should be adjusted as per regional specifics. Crude oil is sent to the factory equipment for primary oil preparation, which consists of operations for removal of mechanical impurities, gas, water and mineral salts. The plant is additionally equipped with reservoir with daily reserve of raw material and reservoir for storage of excessive gas. Initial launch of the plant is performed with hydrogen-containing gas. It can be molecular hydrogen, methane, ethane, butane-propane mixture of natural gases.

COMPOSITION OF THE EQUIPMENT

Activation, continuous operation and shutdown of the plant are managed by several systems: electrical, hydraulic, "Monitoring" system, automatic control system.

The electrical system includes the required number of electrical installation items, that ensure switching on, continuous operation and shutdown of electrical elements of the plant. The system uses three-phase 380V power supply. The system also includes two electric motors providing operation of the pump and reactor mixer.

Hydraulic system provides connection of plant to feeding pipe header (to pipe) which is used to transport raw material to reactor by pump. Raw materials are evacuated from the plant reactor by pump into intermediate hermetic tank. In this tank gravity separation of the outlet product takes place. It is separated into two phases: gas and liquid. The processed product is sent to a column of atmospheric distillation. After the column, the product is separated into fractions. The gas released in the intermediate tank is directed to a compressor (*not shown on Fig.1*) and a receiver (*not shown on Fig.1*). The receiver maintains required working volume of gas, which is sent to the plant. The hydraulic system consists of the following equipment: pipes, fittings, isolation valves, filters, gear pump, reactor.

"Monitoring" system is used for automatic or manual composition of database of current readings of analog and digital sensors.

Automatic control system ensures uninterrupted continuous operation of the plant according to optimal processing modes defined during hydrocarbon raw material testing.

INSTALLATION

The plant should be built in the flow diagram of oil refinery, to the line preceding initial heating of raw materials (at temperatures of 20 - 80 °C) in compliance with generally accepted standards, standards of OPEC and other countries (*i.e. ISO 10418:2019, ISO 10437:2003, ISO 10438-1:2007 , ISO 10438-2:2007, ISO 10438-3:2007, ISO 10438-4:2007, ISO 10441:2007, ISO 12211:2012 , ISO 12212:2012, ISO 13702:2015, ISO 13703:2000, ISO 13703:2000/Cor 1:2002, ISO 13704:2007, ISO 13704:2007/Cor 1:2008, ISO 13705:2012, ISO 13706:2011, ISO 14691:2008, ISO 14692-1:2017, ISO 14692-2:2017, ISO 14692-3:2017 , ISO 14692-4:2017, ISO 15138:2018 , ISO 15544:2000, ISO 15544:2000/Amd 1:2009, ISO 15547-1:2005 u.ISO 15547-2:2005 ISO 15649:2001 SO 16812:2019, ISO 17776:2016, ISO 23251:2019, , ISO 24817:2017, ISO 25457:2008, ISO/TS 27469:2010 , ISO 27509:2012, ISO 27509:2012/Cor 1:2013 , SO/PRF :2008 , ISO 28300:2008/Cor 1:2009 DIN ISO 1219-1:2007).*