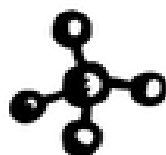


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PROCESS GAS CHROMATOGRAPH MAG

Applications

B
A
K
C



**Organic Substance
Production**

Relevance

Every year demand on **Basic Organic Chemicals**, which are components for production of a large number of substances, is constantly increasing. Without these substances: polymers, surfactants, pesticides, additives, etc. it is practically impossible to imagine life of a modern man.

Besides, business competition also increases - customers need high quality product at a fair price. The first can be achieved by carrying out continuous monitoring of raw materials and products quality, the second - by use of the information received to increase production efficiency.

The best option for solving this problem is to use **Process Gas Chromatograph MAG**



Chromatograph MAG (model KC 50.3 10-000-01) is a modern high-tech equipment of home manufacture, which meets or exceeds world analogues. Flexible **modular** and **explosion protected** design allows you to choose the right configuration for a wide variety of analytical problems.

Detector Type

- ✓ **Thermal conductivity detector (TCD)**
Allows you to use micro-packed and capillary columns. Provides fast analysis and low limits of detection
- ✓ **Thermo-chemical detector (CCD)**
Allows you to carry out accurate measurement of low concentration flammable compounds, including hydrogen, hydrocarbons, etc.
- ✓ **Electro-chemical detector (ECD)**
Allows you to analyze sulfur-containing compounds from 0.1 ppm using only air as a carrier gas.
Provides linearity at wide range of measurement and high selectivity to H₂S and mercaptans.

Option:

Liquid Sample Injector

External heated sampling valve or injector-vaporizer provides direct introduction of vaporized liquid sample into analytical column without any losses of analyzed compounds. Maximum temperature of the injector is 220°C.



Advantages Of Process Gas Chromatograph:



Process optimization;



Reducing the costs of recycling and consumption
waste disposal.



Quality control of raw materials, intermediate and end
products



Energy saving

B

A

C

S

Applications

Further will be considered the basic technological processes of organic substances production and some of the possible **applications** of a **process gas chromatograph MAG**

The above list is not exhaustive.

To clarify the possibility of using the chromatograph MAG to solve a particular analytical problem, please fill in a **questionnaire**.



Production of lower olefins and dienes (pyrolysis of oil fractions)



Production of propylene (propane dehydrogenation)



Production of isobutylene (dehydrogenation of isobutane)



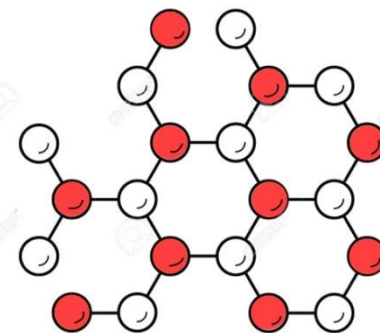
Production of ethanol (ethylene hydration)



Production of methyl tert-butyl ether (MTBE) (synthesis from methanol and isobutylene, comprising fraction)



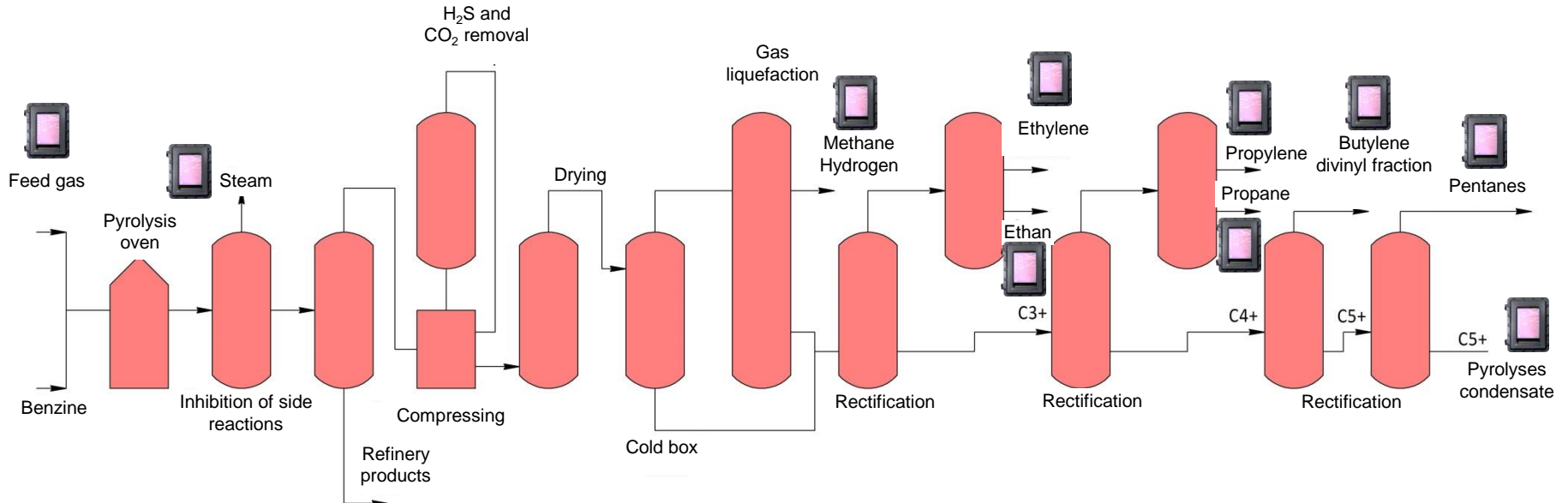
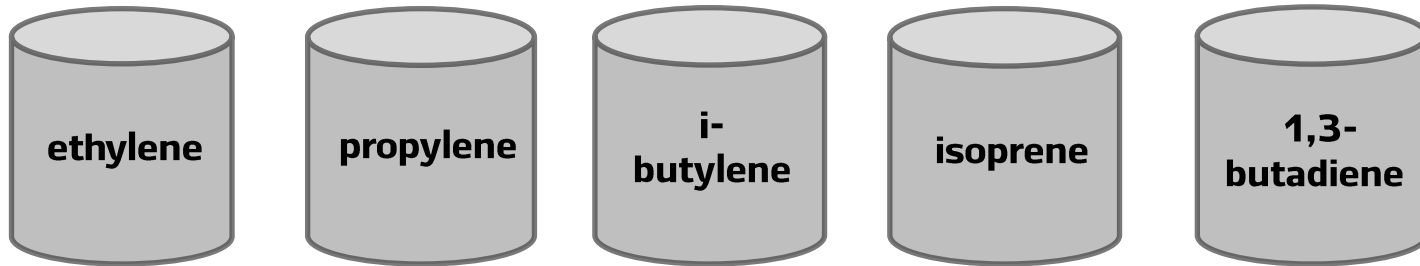
Production of acrylic acid (two-stage oxidation of propylene)



Production of Lower Olefins and Dienes

Process: pyrolysis of oil fractions or hydrocarbon gases (steam cracking)

Synthesis:



Process Flow Diagram of Pyrolysis Unit

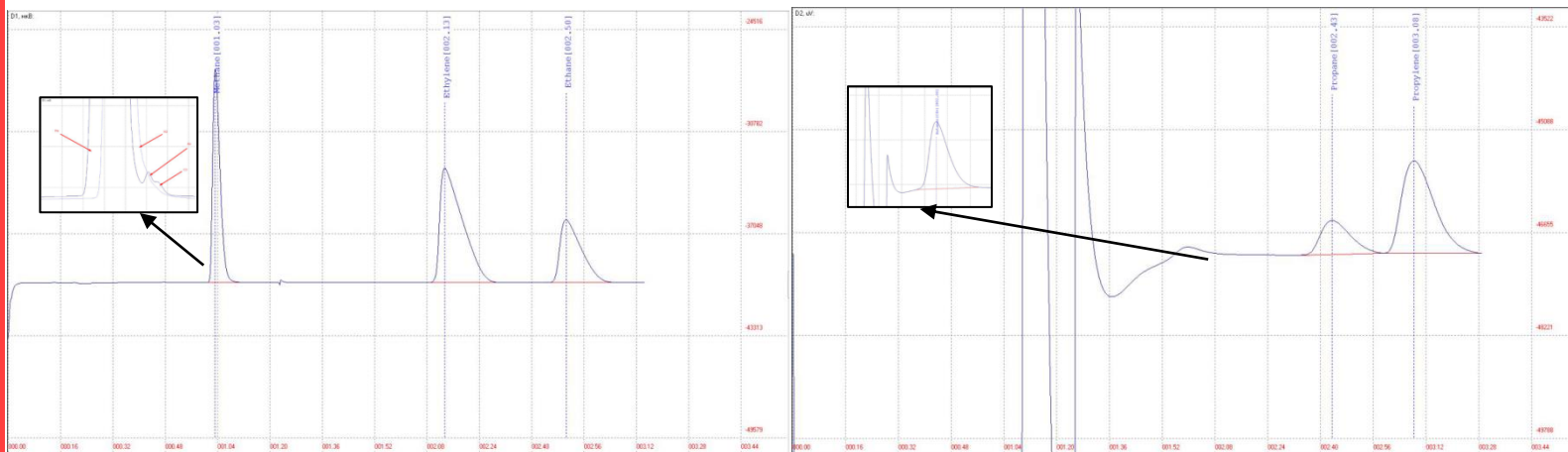


Examples of Solutions

Oil Fraction and Hydrocarbon Gases Pyrolyses

Features of Chromatograph	
Analyzed medium	Gas
Analyzed components	H ₂ , CO, CH ₄ , ethylene, ethane, propylene, propane, C ₄ +
Detector type	TCD
Number of analytical channels	2
Column type	Micro-packed
Carrier gas	Argon, Helium
Duration of analysis	4:30 [min:sec]

Chromatograms of thermal cracking products for olefin production

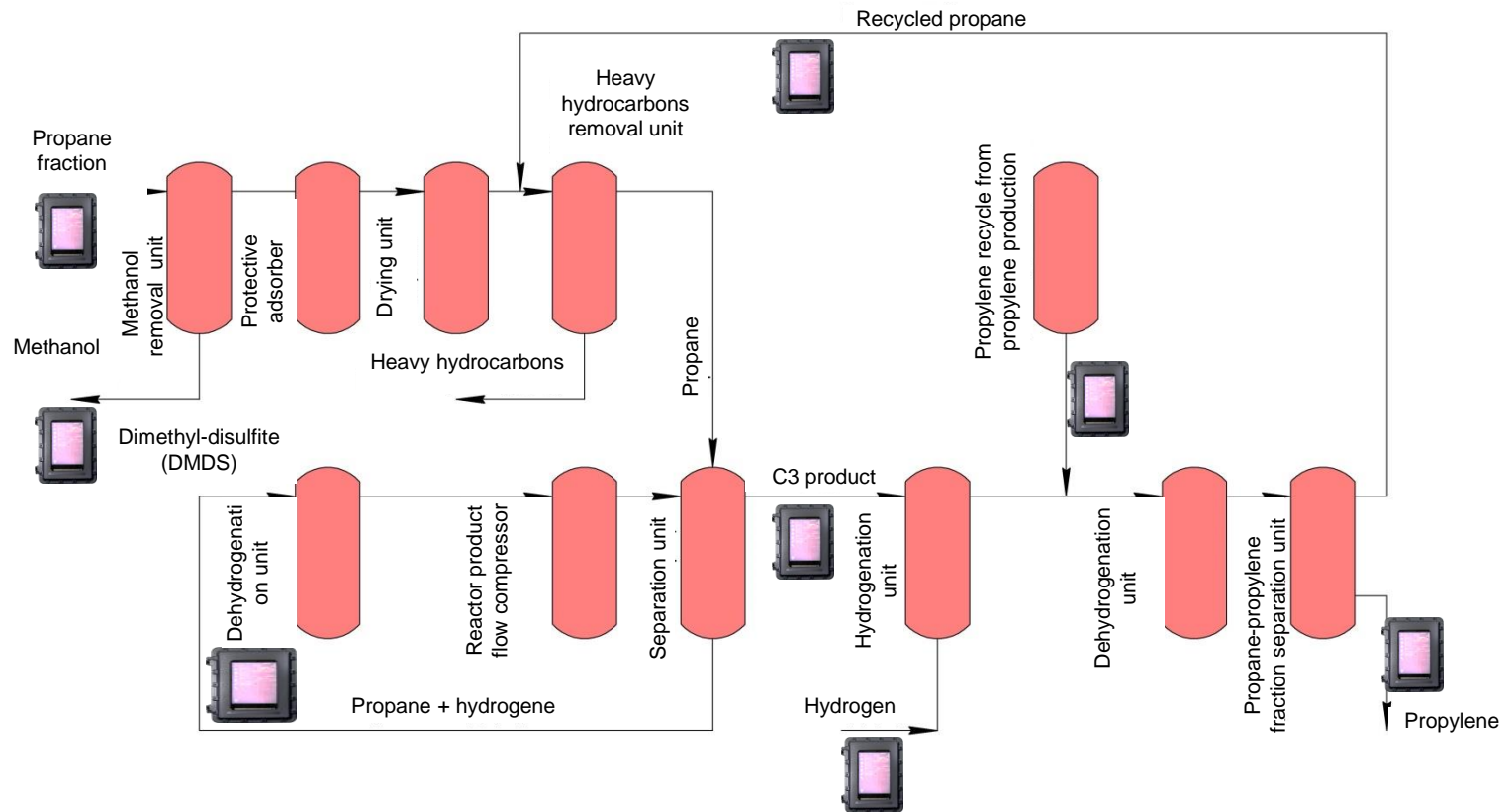


Analytical channel № 1 chromatogram (H₂, CO, CH₄, ethylene, ethane)

Analytical channel №2 chromatogram (propylene, propane, C₄+

Production of Propylene

Process: propane dehydrogenation



Process Flow Diagram of Propylene Production

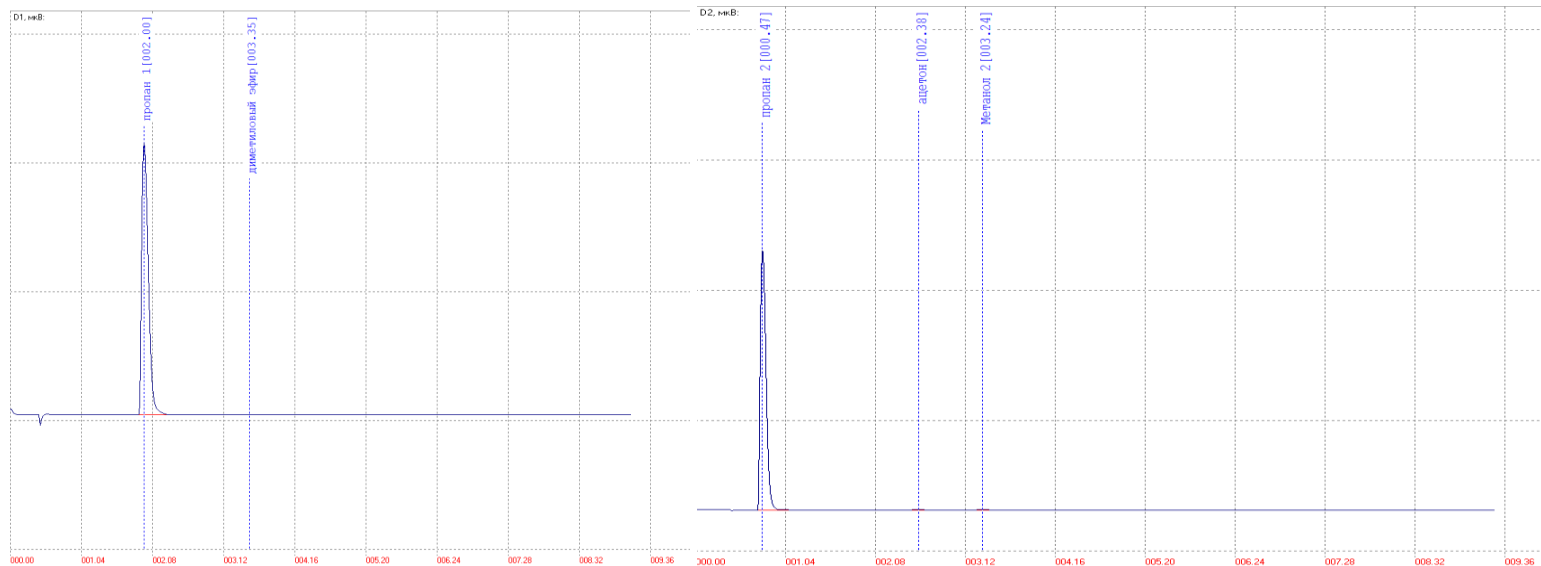


Examples of Solutions

Propane Dehydrogenation (Production of Propylene)

Features of Chromatograph	
Analyzed medium	LPG
Analyzed components	Methanol, acetone, dimethyl ether
Detector type	TCD
Number of analytical channels	2
Column type	Micropacked
Carrier gas	Helium
Duration of analysis	9:50 [min:sec]

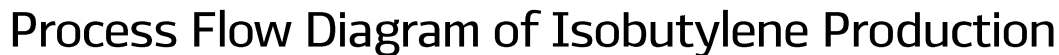
Dehydrogenation of oxygenates in propane



Analytical channel № 1 chromatogram (**dimethyl ether**)

Analytical channel №2 chromatogram (**Methanol, acetone**)

Process: dehydrogenation of isobutane



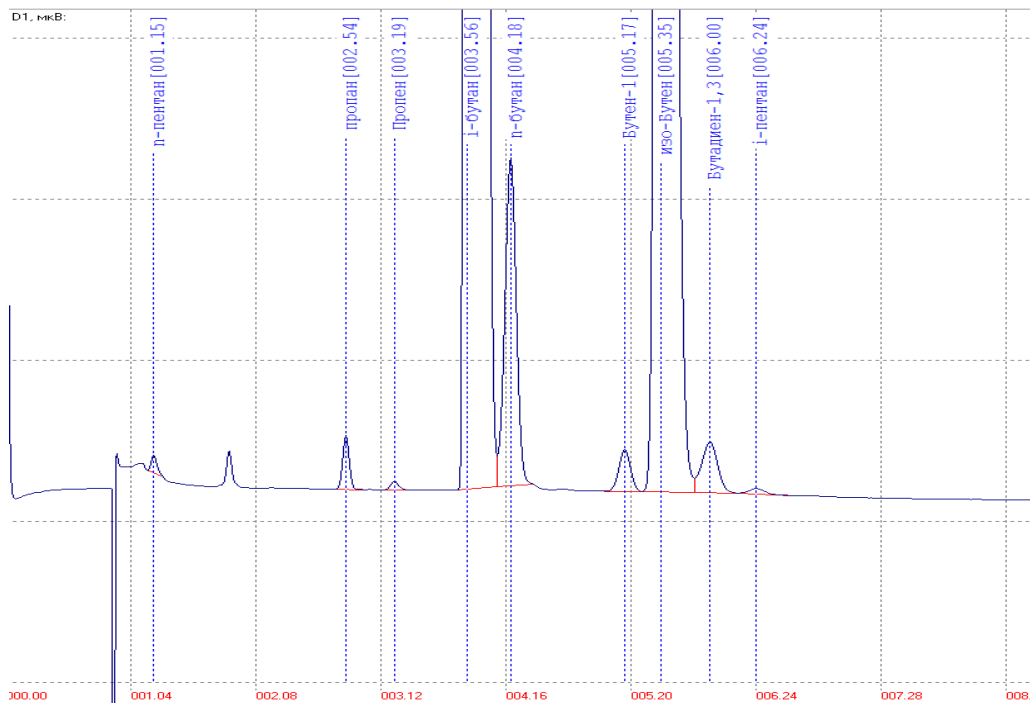
Examples of Solutions

Dehydrogenation of Isobutane

Features of Chromatograph

Analyzed medium	LPG
Analyzed components	Isobutane, isobutylene
Detector type	TCD
Number of analytical channels	1
Column type	Micropacked
Carrier gas	Helium
Duration of analysis	9:55 [min:sec]

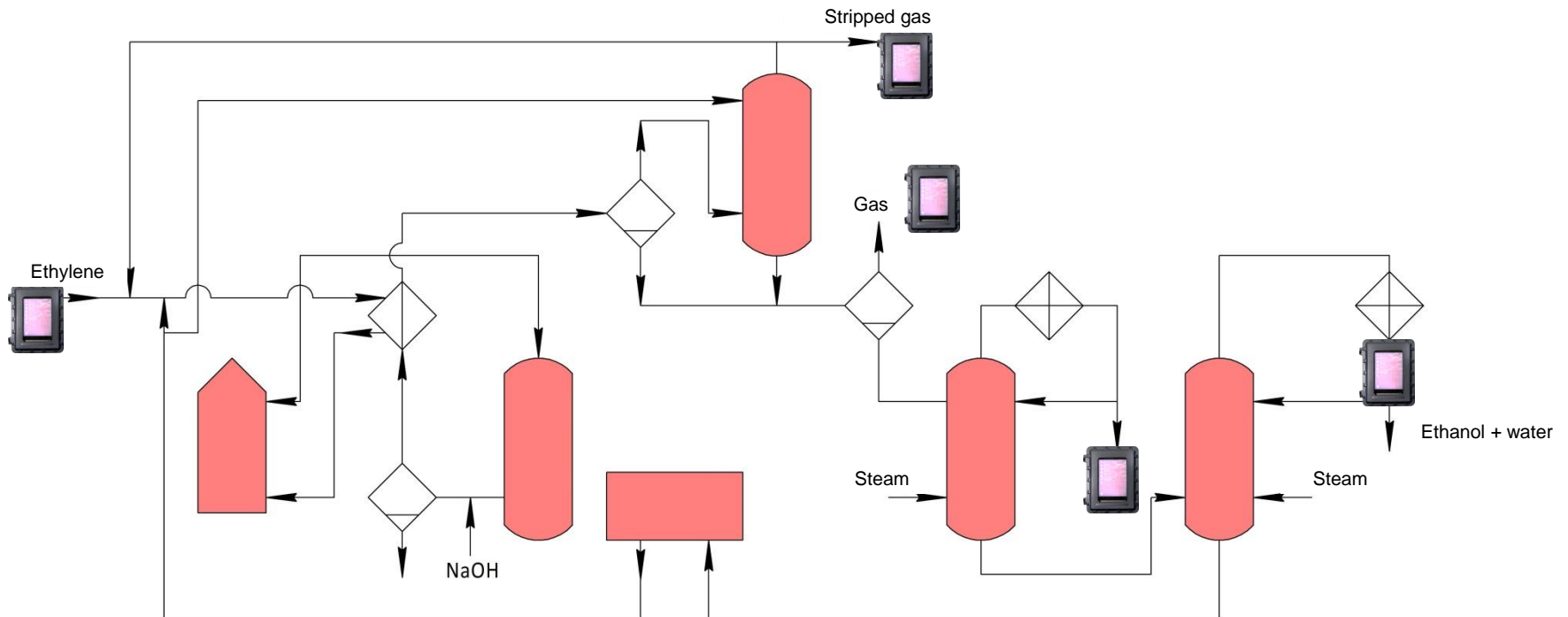
Control of composition content of isobutane-isobutylene fraction (IIF)



Analytical channel
№ 1 chromatogram

Production of Ethanol

Process: vapor-phase hydration of ethylene at high temperatures and pressures.



Process Flow Diagram of Ethanol Production



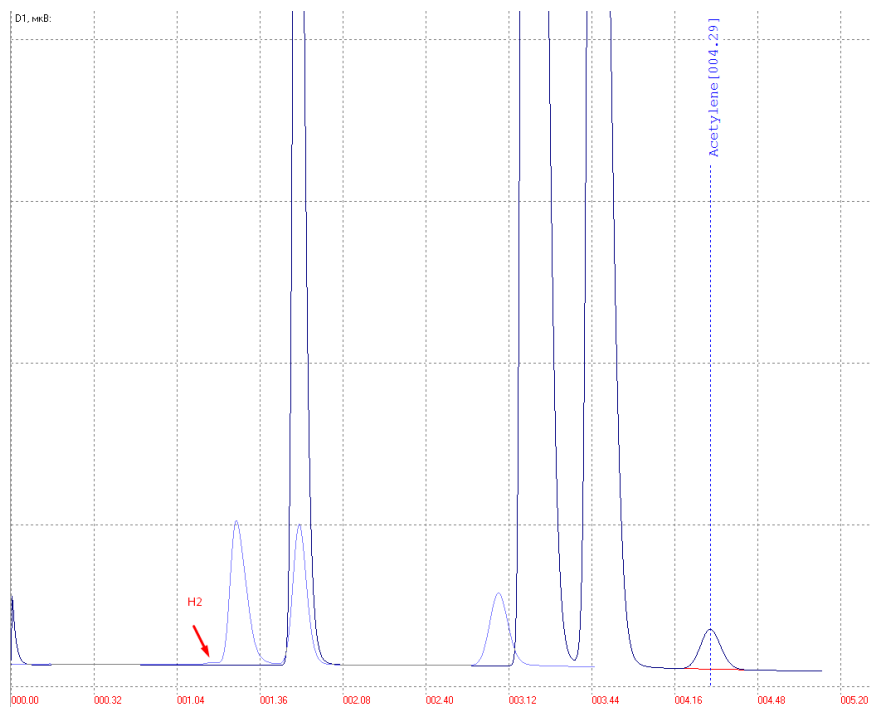
Examples of Solutions

Production of Ethanol (ethylene hydration)

Features of Chromatograph

Analyzed medium	Gas
Analyzed components	Acetylene, ethane, ethylene
Detector type	TCD
Number of analytical channels	1
Column type	Micropacked
Carrier gas	Helium
Duration of analysis	6:00 [min:sec]

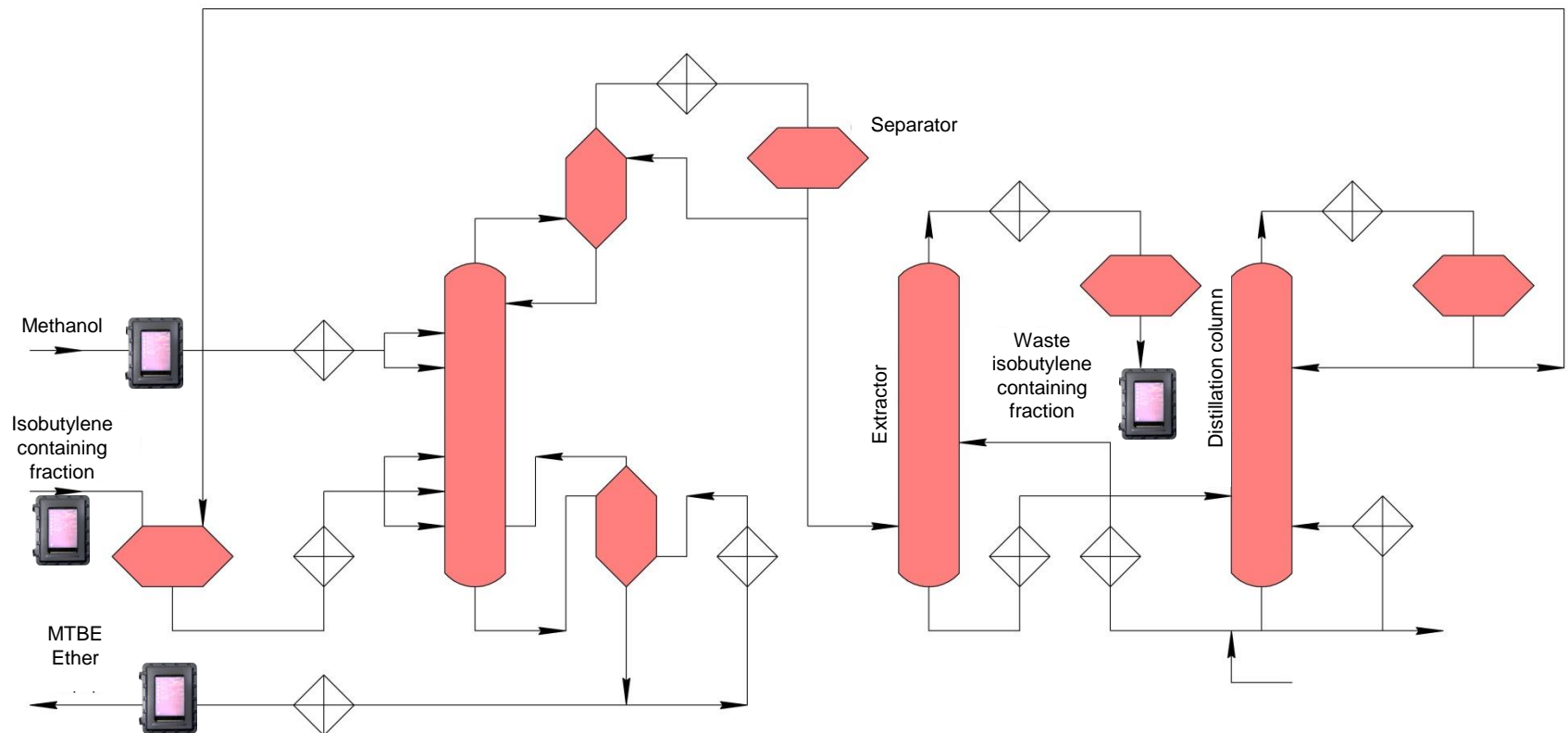
Control of composition of ethylene-ethane fraction



Analytical channel № 1
chromatogram

Production of Methyl Tert-Butyl Ether (MTBE)

Process: synthesis from methanol and isobutylene containing fraction



Process Flow Diagram of MTBE Production



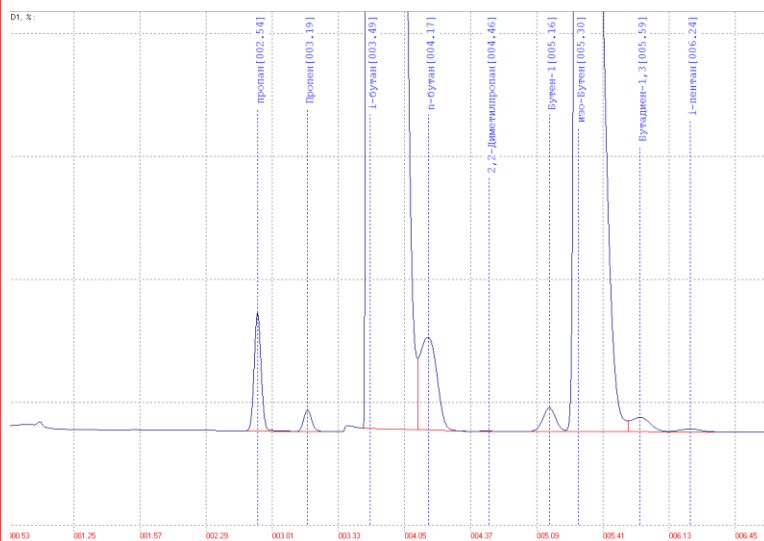
Examples of Solutions

Synthesis of Methyl Tert-Butyl Ether

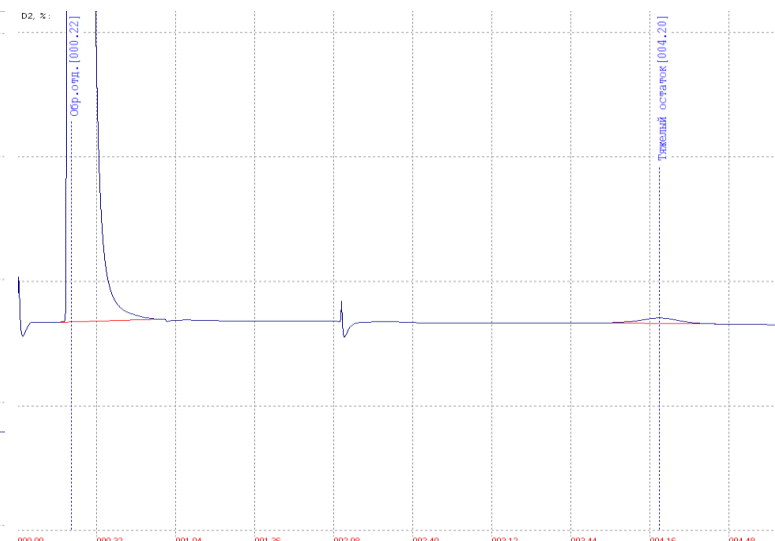
Features of Chromatograph

Analyzed medium	LNG
Analyzed components	Hydrocarbons C3-C5, heavy residue
Detector type	TCD
Number of analytical channels	2
Column type	Micropacked
Carrier gas	Helium
Duration of analysis	9:55 [min:sec]

Control of composition of i-butane isobutylene fraction downstream E-201



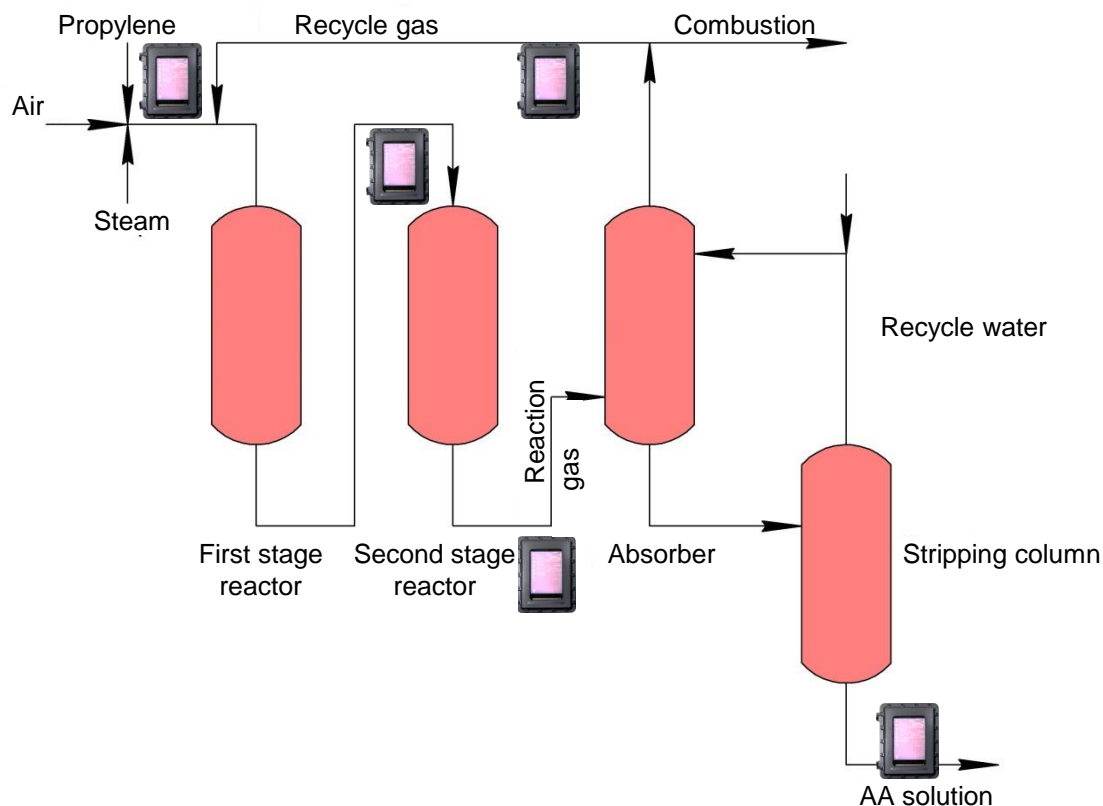
Analytical channel №1 chromatogram
(hydrocarbons C3-C5)



Analytical channel №2 chromatogram
(heavy residue)

Production of Acrylic Acid

Process: two-stage oxidation of propylene (I – propylene oxidation to acrolein, II – acrolein oxidation to acrylic acid)



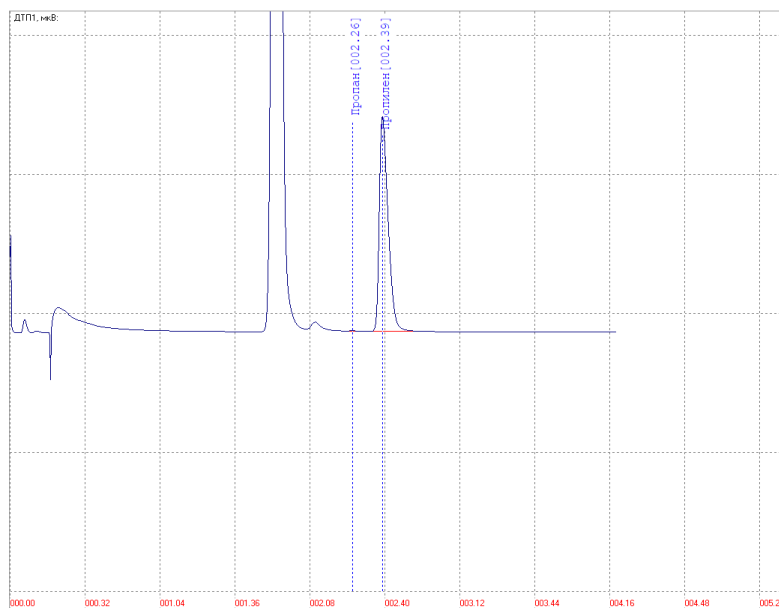
Process Flow Diagram of Acrylic Acid Production

Examples of Solutions

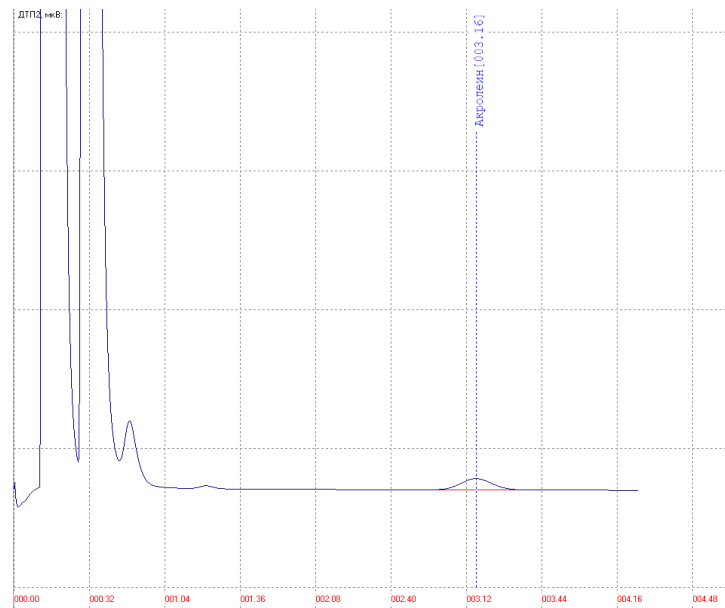
Production of Acrylic Acid

Features of Chromatograph	
Analyzed medium	Gas
Analyzed components	Propane, propylene, acrolein
Detector type	TCD
Number of analytical channels	2
Column type	Micropacked
Carrier gas	Helium
Duration of analysis	7:55 [min:sec]

Control of acrylic acid and ethers generator package



Analytical channel №1 chromatogram
(propylene, propane)



Analytical channel №2 chromatogram (acrolein)

Other Applications of Chromatograph MAG

Isoprene Production

Process: isopentane dehydrogenation

Methanol Production

Process: synthesis from carbon oxide and hydrogen

Ethylene Oxide Production

Process: gas phase oxidation of ethylene with oxygen or air

Ethylen Glycol Production

Process: non-catalytic hydration of ethylene oxide

Aromatic Production

Process: catalytic reforming of straight-run gasoline fractions, alkylation, dehydrogenation, etc.

Reference List

No.	Customer	Location	Objectives
1	CJSC Togliattisintez (SIBUR Togliatti LLC)	Production of Dimethyldioxane and formaldehyde recovery unit И-6	Analysis of the direct isobutane-isobutylene fraction (IIF)
2	CJSC Togliattisintez (SIBUR Togliatti LLC)	Production of Dimethyldioxane and formaldehyde recovery unit И-6	Analysis of the reverse isobutane-isobutylene fraction (IIF)
3	Tobolsk- Neftekhim LLC (SIBUR Tobolsk LLC)	ADPU Central Gas Fractionation Unit shop	Analysis of oxygenates in dry propane
4	JSC ROSPAN INTERNATIONAL (East Urengoy license area, Gas and Condensate Processing Plant)	Condensation stabilization unit No. 1. Condensate stabilization line unit no. 1	Analysis of LPG (technical propane-butane)
5	PJSC Tatneft	Tatneftegazpererabotka GFU-2 shop no.2	Propane fraction quality analysis at GFU-2
6	PJSC Tatneft	Tatneftegazpererabotka GFU-2 shop no.2	N-butane fraction quality analyses at GFU-2 shop no.2

Reference List

No	Customer	Location	Objectives
7	JSC Sibur- Neftekhim (SIBUR Dzerzhinsk LLC)	Production of acrylic acid and ethers, shop 101	Analysis of propane, propylene and acrolein in the production of acrylic acid
8	PJSC Omsky Kauchuk	Pipeline for exhaust gases to the separator pos. 213	Process control of isopropylbenzene content in exhaust gas
9	CJSC Togliattisintez (SIBUR Togliatti LLC)	MTBE Preparation Unit Д3, downstream mixer 205a in P206/1,2	Process control of the composition of the hydrocarbon charge
10	CJSC Togliattisintez (SIBUR Togliatti LLC)	MTBE Preparation Unit Д3, downstream reactors P206/1,2	Process control of the content of isobutylene, MTBE and methanol
11	CJSC Togliattisintez (SIBUR Togliatti LLC)	MTBE Preparation Unit Д3	Process control of the MTBE composition

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