

<b>Technological Task 27</b>	<b>Reducing excessive emissions of pollutants into the atmosphere from heating furnaces when burning untreated gas and finding ways to solve this issue.</b>
<b>Essence of the Problem:</b>	<p>In the technological process of preparing and transporting oil at fields, associated oil heaters are used, which primarily burn raw associated petroleum gas (unprepared). This leads to the following consequences:</p> <ul style="list-style-type: none"> <li>• High wear and tear of technological equipment and a sharp reduction in MRP due to the fluctuating parameters of APG and the content of heavy fractions with high combustion temperatures.</li> <li>• Changes in the composition (richness) of the gas and its physicochemical properties (moisture content and harmful impurities) lead to an unstable gas combustion system and changes in the parameters of pollutant emissions into the atmosphere.</li> <li>• Using unprepared APG with fluctuating composition parameters and physicochemical properties leads to high energy costs for heating oil, etc. During inspections by environmental control authorities, excessive emissions of pollutants into the atmosphere from oil heating furnaces, increased emissions of pollutants, and greenhouse gas (CO<sub>2</sub>) emissions are detected. To prevent possible violations, it is necessary to develop and implement technical measures to reduce emissions of pollutants and greenhouse gases (emission reduction projects).</li> </ul>
<b>Required Technological Parameters:</b>	<ul style="list-style-type: none"> <li>• Research on the technological processes of oil heating and the features of the design of associated oil heaters and fuel gas burners.</li> <li>• Study of the composition of fuel gas and its physicochemical properties, including historical data from HAL.</li> <li>• Study of the parameters of "exhaust gases" and the dynamics of changes in their composition depending on the composition of the fuel gas and external factors.</li> <li>• Research on the design features of burners and the system for enriching fuel gas with oxygen.</li> <li>• Analysis of heat tubes for external corrosion at the point of plasma exposure.</li> <li>• Research on energy losses of associated oil heaters to determine the point and cause of losses.</li> <li>• Modeling and development of a highly efficient fuel gas burner with maximum efficiency and environmental parameters for gas afterburning.</li> <li>• Modeling and development of an additional pyrolysis gas afterburning system to increase furnace efficiency and reduce harmful emissions.</li> <li>• Modeling and development of a fuel gas heating system to improve raw gas combustion efficiency in winter.</li> <li>• Modeling and development of direct or indirect measurement of fuel gas composition to adjust oxygen enrichment regimes and gas flow rate to minimize CO<sub>2</sub> emissions while maintaining oil heating parameters.</li> <li>• Modeling and development of filtering elements of the exhaust system of associated oil heaters with the addition of catalytic inserts to minimize harmful emissions.</li> </ul>

	<ul style="list-style-type: none"> <li>• Development of an environmental impact analysis system and the need for technical maintenance of individual elements of the oil heating system.</li> </ul>
<b>Existing Methods for Solving the Problem:</b>	<ul style="list-style-type: none"> <li>• Replacement of burners at GU;</li> <li>• Maintenance of heating furnaces;</li> <li>• Conversion of furnaces to natural gas and construction of an associated petroleum gas preparation plant;</li> <li>• Construction of a new gas pipeline 62.5 km long;</li> <li>• Development of burners with increased efficiency and afterburning parameters;</li> <li>• Development of a system for afterburning pyrolysis and exhaust gases;</li> <li>• Development of a system for monitoring the composition of fuel gas for automatic adjustment of combustion regimes, aimed at minimizing harmful emissions while achieving heating efficiency parameters;</li> <li>• Development of a system for the preliminary preparation of fuel gas;</li> <li>• Replacement of associated oil heaters with highly efficient gas piston power plants combined with environmentally friendly oil induction heating systems.</li> </ul>
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<b>Expert Notes:</b>	