

## Development of high-efficient compact fuel processor with microchannel reformer

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According to the order of the National Innovation Company "New Energy Projects" a partial methane oxidation fuel processor (Fig.1).has been developed and tested, which generates synthesis gas in amounts necessary to provide power source of a high temperature fuel cell battery of electric power of 2 kW. The fuel processor is integrated by heat with the battery using anode gas heat. The fuel processor reformer is manufactured using the microreactor technology. The technological unit incorporates a sulfur cleaning unit providing cleaning of natural gas from hydrogen sulfide to a level of 5 mg/m<sup>3</sup> within a half a year in addition to the reformer and heat exchangers. The unit feeding air to the technological unit of the fuel processor incorporates a membrane pump, a filter and a device making it possible to control the air flow rate by the variation of pump current frequency. A control unit has been developed and manufactured for the fuel processor, which enables the operating parameters to be monitored by means of computer. The control unit is able as well to cut off methane and air feed to the fuel processor in the case of emergency situations.





Tests as conducted demonstrated the fuel processor serviceability. With nominal fuel flow rate the operating temperature of the fuel processor is at a level of (800–850)° C. The time the reformer needs to attain at 850°C at startup is (30–40) min. Depending on the fuel flow rate and methane-air proportion the temperature of the reformer and synthesis gas can be below or above the abovementioned value.

The analysis results on reformat composition at the fuel processor exit indicate that the methane conversion at Fig.1.

Reformer temperatures of (850–900) °C when the catalyst activity is high is equal to 95%. Yield in terms of hydrogen and carbon oxide is close to the calculational indices. As temperature lowers, the catalyst activity drops and, consequently, the methane conversion decreases. At present the fuel processor is being tested for its performance and lifetime in "Keldysh Center". Tests are being conducted according to the NIC"NEP" program.

The created specimen may serve as a basis for the development of the fuel processor for a high capacity power unit.