



IV Międzynarodowa Konferencja ODNAWIALNE ŹRÓDŁA ENERGII

techniki, technologie, innowacje 20-23 czerwca 2017 r.- Krynica-Zdrój

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STUDY OF A STEAM PISTON ENGINE IN A SUPERCRITICAL CONDITIONS

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Summary: The aim of the study is the intelligent development of cogenerating micro power plants that are ultimately driven by biogas, biomass or any other fuel (aspect envisaged in the prototype development system) with a pulsed piston steam engine, a generator or a water brake (modelling, simulating, replacing workloads). The research system included the following core elements:

- Induction supercritical steam generator (eventually replaced with steam boiler powered by biogas, biomass or other solid or liquid fuel)
- piston steam engine powered with steam of supercritical parameters with a patented steam feed system with impulse injection valve,
- electricity generator (alternatively with water brake),
- steam regeneration system.

As a result of the research, an injection valve design has been developed which fulfils the intended functions and enables the engine to function smoothly, as evidenced by the basic engine characteristics developed. The average power output on the motor shaft was over 20 kW, which, with the power supplied by the 45 kW steam generator, gives an expected overall efficiency of 44%. According to the estimates from the steam regeneration system, 45% of the condensation heat of steam exiting the engine can be recovered, which increases the overall efficiency of the micro power plant to 89%.

The results for intelligent development allow us to formulate conclusions and patent descriptions for the innovative design of a new generation steam engine and to protect the industrial design of a micro power plant with this steam engine.

Keywords: Steam engine, supercritical steam, micro-thermal power plants

