



**Politechnika
Śląska**



**Instytut Maszyn i Urządzeń
Energetycznych**

**„Badania nowych układów przepływowych pomp
zatapialnych napędzanych silnikiem
elektrycznym chłodzonym płaszczem wodnym”**

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Summary

The subject of the research is a submersible pump with an electric engine and a water cooling system. The design of the pump must fulfil the requirements for machines used in coal mines, where the risk exists of a methane or coal dust explosion. The work included a designing process and a manufacture process of a prototype as well as the tests that allowed to verify the achieved results. The design process focused on the increase of the pump efficiency while the operating point is maintained as given. At the same time the aim of the design process was to decrease the weight of the machine in relation to the existing solutions, develop a sensor arrangement that was optimal for the control system and implement electric engine with an appropriate control system.

The thesis includes a description of the new design solutions for the pump and especially for its flow system. A research was conducted on the flow losses in the existing machines and the new design. A test stand was designed and built for the tests of various shapes of the prototype rotor in order to determine the optimal diameter of the rotor. The pressure distribution was measured to determine the appropriate arrangement of the sensors for the control system.

The prototype underwent the tests required for this type of machines by a certification company. The results were positive and confirmed that the pump satisfies the demands for the operation in coal mines, where the risk is present of the methane or coal dust explosion. The results of the empirical tests were compared to the results of the numerical modelling. The comparison indicated that there is even a potential for further improvement. The laboratory tests involved also chosen pumps that are already used in coal mines. The tests showed that the efficiency of the designed pump was about 15 percentage points greater than the efficiencies of the available pumps of similar size.