Development and construction of a test unit for components of planetary roller extruders

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Client:
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Task

This project is developed in cooperation with battenfeld-cincinnati Germany. The topic is the development of a test unit for components of planetary roller extruders. The current used test unit shall be replaced to make the test of the components safer and more economic in the future. In the course of restructuring the new test unit shall be integrated in the welding shop. The leak tightness and the flow of the oil will be tested by the test unit. This is necessary to avoid leaking components. A repair or replacement of a faulty component in the extruder at the customer requires a high effort and high costs. The test parameters are defined as follows: The oil heats the component to 250°C and a maximum pressure of 50 bar. At the same time the flow of the oil will be checked and afterwards a visual inspection will be done.

Implementation

The whole test unit consists two components which are connected by pipes. At first there is the control unit which contains the components for the controlling and regulation of the test unit. This includes a temperature control unit which heats the oil and a cooling device. Also there the hydraulic components. They are necessary for the testing procedure. The main component is the pneumatic/hydraulic pressure intensifier. That takes care that in the hydraulic circuit which is heated on $\theta_{\text{max.}} = 250$ °C the pressure of $p_{\text{max.}} = 50$ bar can be generated. On the other hand there are the motor-controlled valves. These separate the hydraulic circuit in two different circuits. The one circuit is for low pressure for filling the PWE-component with oil and for measuring the flow of the oil. The other circuit is for testing the components of leaks at high pressure. This separation is necessary to avoid that the temperature control unit gets the high pressure of 50 bar which would damage it. Further components are the turbine flowmeter, some filters and the electrical controller. The control unit is with a welding construction enclosured. That consists service doors to facilitate maintenance. The second component of the test unit is the test chamber. In which is the table for the PWE-component. This table can be loaded with a weight of 2000 kg. The two holders of the table have a linear slideway. Thus, the longest component with a length of 2535mm and as well shorter components can be placed on the table. Because of the visual inspection and the safety at the operation were very important the test chamber is constructed moveable. This is necessary that the components can be loaded with a crane on the table. Also it is constructed with a double glazing. This ensures a high safety.
against a bursting of a component and on the other hand it enables to exhaust the heated air. Thereby the outer pane will not strongly heat up and it avoid occurring a damage by touching of it.

**Conclusion**

At the redesign the increase of economics, ecology and especially the work safety were in focus. The new test unit is exclusively constructed with components which were on the state of the art and the current safety standard. The development succeeded by intensive arrangements with the project partners like various suppliers und battenfeld-cincinnati Germany. The technical innovations opposite the currently used test unit are extremely extensive. With the integration of an PLC, the motor-controlled valves and the pressure intensifier it is possible to automate the whole test procedure. Only the visual inspection and the draining of the pressure intensifier has to be done manually. Due to the easier handling the test procedure is independently from the operator. The cooling process is revised as well. At each cooling process potable water was wasted. Due to usage of the cooling unit as far as 88m³ of potable water will be pared down. Thereby the operating costs will be reduced. During the project every member of the team had to deal with sophisticated tasks. The team was able to combine available competences with newly learned knowledge and elaborate the purpose of the new test unit. During that time a structured working method was established by every member of the team. The implementation of the project is expected by virtue of the described improvements in the near future.