

Modernization of Hydraulic Actuators

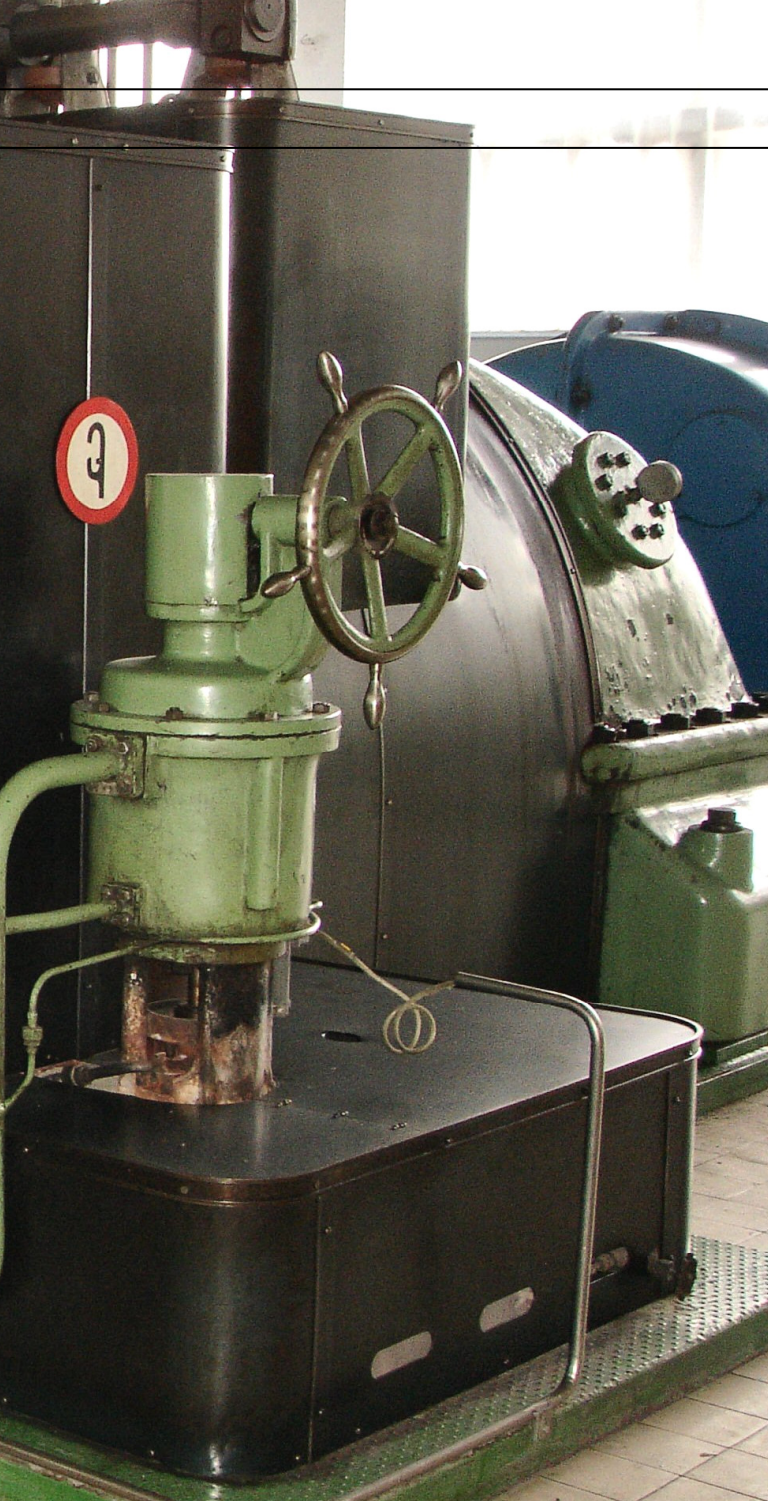
IN COURSE OF PLANT MODERNIZATIONS existing machines are often switched over to operation via DCS. This means that hydraulic actuators will be controlled via 4 ... 20 mA signals.

Hydraulic actuators are often used in combination with turbo compressors and steam or gas turbines. Their task is to run blow-off valves, inlet guide vanes as well as valves for steam or gas supply. Due to their reaction without delay, hydraulic actuators are perfectly suited for control tasks. In terms of control it would be a step backwards to replace a hydraulic actuator by a pneumatic one.

A closed loop actuator always includes the actuator itself and the positioner (the pilot control with integrated position feedback). The pilot control consists of a combination of elements as pilot valve, feedback piston, levers, springs and dia-

gram bellows. Experience has shown that many service engineers hesitate to touch this complexly appearing mechanical unit and avoid any maintenance or adjustment work. They rather prefer their replacement by suitable electronics. Such a modification becomes necessary in case of implementing the unit into a DCS.

Common solutions are the implementation of I/p-converters (mA to pneumatic pressure) or I/h-converters (mA to hydraulic pressure) between electrical controller output and pilot control.



kmo turbo GmbH - steam turbine with low pressure hydraulics

The Retrofit Concept of kmo turbo

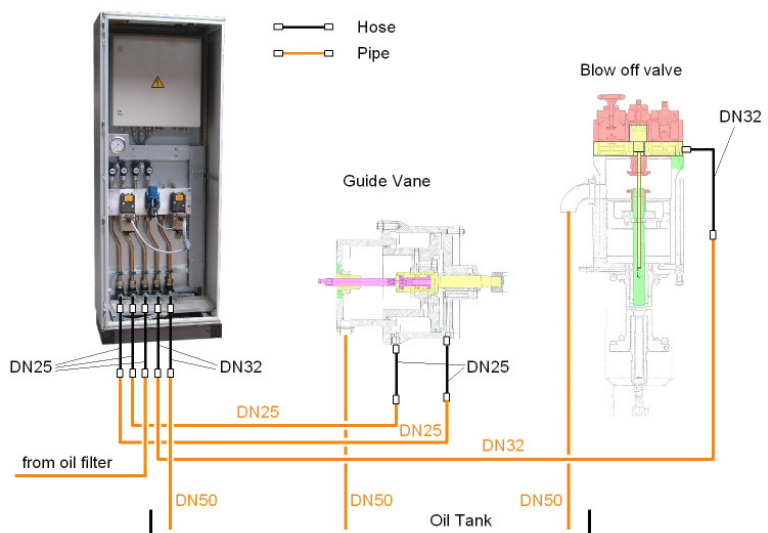
Solutions and Benefits:

- Removal of sensitive components creating malfunctions and requiring intensive maintenance like pilot controls, diaphragm pressure converters and I/p- respectively I/h-converters.
- The actuator is equipped with a 4/3 spool valve controlled via 4 ... 20 mA, moreover with a high-precision, non-contact displacement measuring system.
- The installed 4/3 spool valve is optimized for low pressure hydraulics. It directly operates the actuator. The spool valve is the core of the retrofit; thus **kmo turbo** uses a worldwide approved product of a German manufacturer.
- A compact hydraulic manifold block ensures a leak-free connection of the individual components as 4/3 spool valves, solenoid valve, transmitters and pressure gage. For easy connection the pipe connections inside the cabinet are placed at the bottom.
- All relevant pressures are measured; for remote indication via transmitter, locally via leak-proof plug-in manometer.
- An electrical junction box is installed in the control cabinet, too. The wiring inside the cabinet is pre-assembled and performance tested up to the transfer terminals.
- Well approved is to connect the actuators and the oil pipes by means of high-pressure hoses. This enables the pre-installation of the piping system and shortens the commissioning time.

Even if such retrofits are commonly in use, the results are hardly convincing, because the friction and temperature sensitive pilot control remains untouched. However, the pilot control is the main cause of irregularities. Next to the unpopular pilot control, the converters are an additional possible source of malfunction.

To overcome these challenges **kmo turbo** has developed its own retrofit concept, getting along without the hydraulic-mechanical pilot control and without converter modules.

Central component is a spool valve including an integrated positioning feedback, actuated by 4 ... 20 mA. The spool valve can operate single- as well as double-acting actuators. The actuator is equipped with a high-precision, non-contact displacement measurement which supplies a 4 ... 20 mA signal. The range is adjusted automatically simply by teaching in the end positions.



Schematic drawing of the retrofit: Control cabinet + guide vane actuator + blow-off valve actuator

HYDRAULIC RETROFIT



OLD CONSTRUCTION:
Mechanical pilot control and complex pipework.

Very rarely the design drawings of the existing actuators are available on site. **kmo turbo** is capable of determining the necessary retrofit measures even based on a simple sectional drawing or an on-site inspection only.

The actuators get removed right after shutting down the machine. In a mechanical workshop they get dismantled and precisely measured. Relevant parts become modified or newly designed, if necessary.

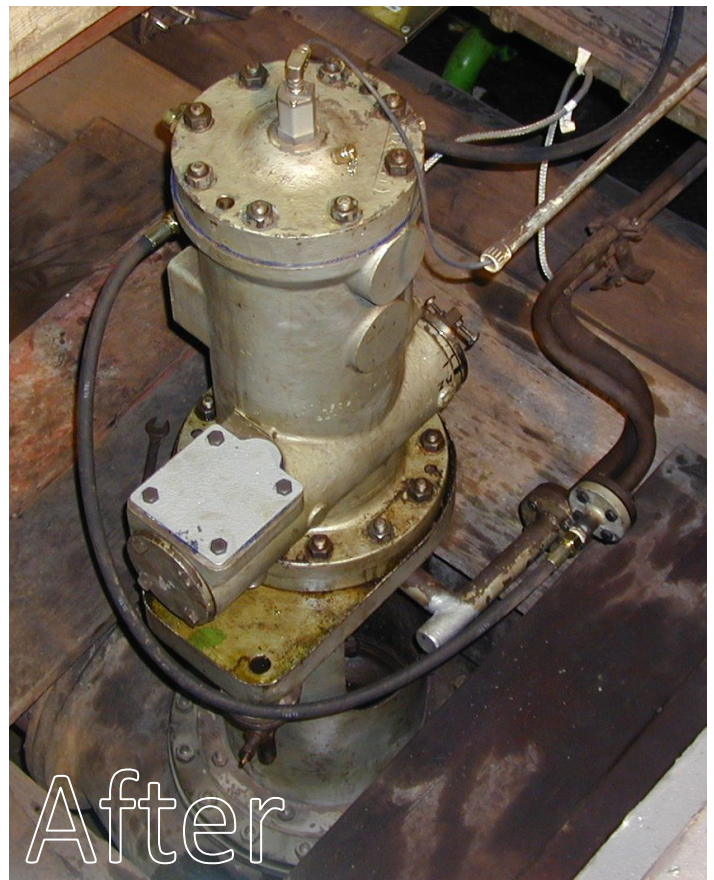
Easy-to-service arrangement of components

Usually a couple of hydraulic actuators per machine have to be modified. All electric and electro-hydraulic components and a junction box are installed in a common control-cabinet. The hydraulic components of all actuators are arranged on a common manifold block. Now there is only one common pressure oil supply and only one common tank line.

The manifold block is equipped with connectors for transmitters for all relevant measuring points. In parallel to the transmitters there are measuring points. The flexible line of a fix installed pressure gage can be adapted to each of these measuring points without any leakage.

Before delivery the cabinet has passed a 100% performance test. The only remaining work on site is the final field wiring and the hydraulic piping.

Additionally each retrofitting is used to generally provide easier maintenance to the actuator: tube fittings are renewed,



NEW DESIGN: Without mechanical pilot control and with non-contact displacement measurement and hose connection.

washers are replaced by O-rings, piston rings are replaced by sealing bands, ...

Mostly the retrofit of hydraulic actuators is used to completely overhaul the valve. Assumed a good forward planning the job can be done within a few days.

Not each design of existing hydraulic actuator is suitable for retrofit to electronic control. In individual cases even renewing the complete actuator may be the more economical solution; **kmo turbo** can rely on proven concepts.

The piping system can be installed in advance. To connect actuator and manifold with the piping system **kmo turbo** recommends the use of HP-hydraulic hoses. This offers several advantages: free from distortion stresses, no transfer of vibrations, fast and easy installation, ...

kmo turbo is specialized in retrofitting hydraulic actuators as well as instrumentation and control systems of turbomachines. Many references exist of successful projects at well-known companies like Airliquide, Arcelor Mittal, BASF, Linde, MAN, Messer, Praxair, Siemens. As a result of using industrial proven components, decades of on-site experience and striving for improvement, innovative, reliable and maintenance-friendly solutions have been created.

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