

Technical Article

Precise hydraulics replace solid steel constructions

Lifting frames from Schnupp for the incorporation of press tools do not need any extensive foundation

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The operator approaches the ideal position of the press ram with concentration in steps of hundredths of millimeters in order to incorporate the tool exactly for body production. The lifting frame from Schnupp was moved from a different position in the tool construction workshop in order to prepare for the production of a new automobile model only a week ago. Its particular advantage: the construction of the lifting frame does without a press pit. It is simply doweled onto the workshop floor. At the same time, the tool-changing slide serves as the lower beam. The 90-metric ton (without tools) machine achieves the power and accuracy required by means of four precisely controlled hydraulic axes from Rexroth, which move the ram synchronously with high precision.

Whenever new bodies are to be manufactured at the pressing plant of an automobile manufacturer, the respective tools have to be incorporated in order for the gap dimensions and geometries to be correct right from the beginning. This is traditionally performed on presses that are not used for daily production. However, the provision of these presses is increasingly uneconomic. An alternative is relatively expensive try-out presses. "By contrast, our lifting frames are intelligent presses", emphasizes Franz Spanfeldner, sales manager and authorized representative at Schnupp. Schnupp GmbH & Co. Hydraulik KG is a family-run, internationally operating special machine construction company rooted in the hydraulics sector. About 160 employees develop and construct solutions concerning mobile and stationary hydraulics as well as operating-media based forming and automation.

Variable concept constantly further developed

Since the beginning of the millennium, Schnupp has been developing and manufacturing different versions of hydraulic presses, with or without a lower beam, with a rigid or rotatable ram, with conventional ram guidance or only positional guidance as well as with different closing forces and accuracies. The design is based on the customer's request and the focus of their tasks. The current, patented development is ideal in terms of precision, flexibility and costs. The concept recently convinced two German automobile manufacturers to independently order two lifting frames each from Schnupp.

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Design and commissioning accelerated by simulation

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To considerably shorten the project term for the four current machines, the design engineers from Schnupp simulated the lifting frames together with forming specialists at Bosch Rexroth. With Simster, they benefited from a model-based, multi-domain simulation platform from Rexroth for the modeling and optimization of controlled drive systems. The design engineers had tested all motion sequences and controller structures before the first screw had even been turned on the lifting frame. "It is decisive for such a simulation that the results are interpreted correctly and implemented in the respective control axes. Bosch Rexroth has a wealth of experience in this field", emphasizes the sales manager from Schnupp.

After the concept had been released by the automobile manufacturer, the lifting frames, which had already been tested in the computer model, could be produced, assembled and commissioned. At the same time as the assembly, the technicians put the software written by Schnupp into operation with Simster. Simster ensures perfect synchronism of the four hydraulic cylinders and maximum positional accuracy of the machine. Commissioning took merely three weeks at the automobile manufacturer.

Safe press modules with type-examination certificate

The control system controls the highly dynamic valves of the control blocks based on the modularly structured IH04 control plate system from Rexroth. The plates that are grouped to form press modules follow a standardized control and safety concept, which Schnupp uses to combine all the necessary motion sequences, such as rapid lowering, precision stroke and return. A type-examination certificate from the Institution for Statutory Accident Insurance and Prevention is available for the safety-relevant press modules. "This has, of course, further accelerated our design processes as it makes numerous documentation tasks and the complicated individual acceptance tests unnecessary", says Spanfeldner. The press modules fulfill performance level e in accordance with EN ISO 13849-1 and the requirements of DIN EN 693:2011.

The scope of functions of the IH04 is state of the art and includes, among other things, a precise pressing force setting, slow return also with spring tools, different rapid traverse modes as well as load sensing and control valves with directional recognition. Special solutions can also be implemented cost efficiently on the basis of the standardized approach without having a

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customized control plate produced as was previously the case. The modular concept enables a uniform program structure for all press sizes and, in this way, also reduces the amount of programming required.

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The press modules control four synchronized hydraulic axes. In addition, Schnupp uses modified standard cylinders from Rexroth with extended piston rods, special sealing systems and integrated filling valves. Incremental position measuring systems ensure positional accuracy of 0.01 millimeters.

Silent power unit with modular design

Schnupp has set up the hydraulic power unit in a modular design on the top of the lifting frame of the machine. The installed power of the main drive is 90 kW. Different pump versions and circuits meet different process requirements. An accumulator charging circuit covers power peaks and flow rates, with peaks of up to 350 liters per minute being achieved at an operating pressure of 280 bar. Since the lifting frames are to be expressly used outside the actual pressing plants too, they may generate working noises only of a similarly low level. The internal gear pump from Rexroth, which operates at a particularly low noise level, makes a decisive contribution to the compliance of the average noise emissions with the applicable limit value in the automobile industry of 75 dB(A).

Maintaining the position for a long time

Not only are metal sheet forming tools incorporated on the lifting frames, but processes with synthetics and carbon fibers are also increasingly tested. It may be necessary for the plunger to be held in an exactly defined tool position for a long time and then to be opened again without dropping. By blocking the valves, the force is maintained without the supply of external energy in the system and a mechanical clamp prevents the tool from dropping. The control system then takes over the smooth opening of the tool.

The lifting frames are designed for remote diagnostics by Schnupp. Service technicians can query all the main data online, such as the degree of clogging of the filters or the oil temperature and level.

"Planning and installing four lifting frames and commissioning them at the customer within a minimum time – that was, of course, a particular challenge for us", summarizes Franz Spanfeldner. "But we also managed to do so successfully thanks to our good and close cooperation with Bosch Rexroth

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and we have been focusing on new projects concerning hydraulics, automation and press systems for a long time now."

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Images



Image 1: Intelligent press from Schnupp achieves power and precision by means of four Rexroth hydraulic axes. Four machines have been set up for pre-assembly in a very confined space. (Copyright: Bosch Rexroth AG)



Image 2: The lifting frame does not need an extensive press pit and can be flexibly disassembled and set up again elsewhere. (Copyright: Bosch Rexroth AG)

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Image 3: Schnupp has set up the hydraulic power unit in a modular design on the lifting frame of the machine. The internal gear pump from Rexroth, which operates at a particularly low noise level, makes a decisive contribution to the compliance of the average noise emissions with the applicable limit value in the automobile industry of 75 dB(A). (Copyright: Bosch Rexroth AG)



Image 4: Time saved in the design by standardized control and safety concept from Bosch Rexroth: the safety-relevant press modules are subjected to a type-examination procedure from the Institution for Statutory Accident Insurance and Prevention and fulfill performance level e in accordance with EN ISO 13849-1 and the requirements of DIN EN 693:2009. (Copyright: Bosch Rexroth AG)

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