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Saving energy while increasing productivity

Servo-hydraulic drive CSH

In deep drawing presses, two subsystems play the decisive role for productivity and workpiece quality: the press drive and the die cushion. A precisely defined blank holder force ensures controlled flow of the material into the drawing die and is the basis for a stable forming process. The innovative Voith CSH Die Cushion Drive provides you with a highly flexible servo-hydraulic drive system. With this drive, you actively and precisely set the curves for position, force and speed – and you can do this over the entire deep drawing process. Your die cushion becomes a servo cushion!

Conventional die cushion drives and control systems usually incur losses. Often, these drives require cooling systems that consume additional energy. Even the energy that the motion of the ram introduces into the die cushion is almost always lost in the form of thermal energy (heat).

Drive your die cushion with innovation

The servo technology used is inherently economical in energy consumption. In addition, it is possible to recover virtually all of the energy of the ram motion in the form of electrical energy. As a result, you considerably increase the energy efficiency of your press. You save up to 80 % of the energy costs compared to a conventional hydraulic die cushion drive without servo technology.

The CSH Die Cushion Drive represents a unique solution both for the modernization of existing presses and for new systems. Customarily, productivity can be increased by 50 % and more. You can fabricate complicated deep-drawn parts economically with a reliable process. The press produces at a remarkably lower cost / piece. You enhance your position over that of your competitors.

Technical data (standard versions)

- Die cushion force 200 to 10,000 kN
- Rated power up to 2 MW
- Position-control accuracy up to 0.01 mm
- Force-control accuracy up to ± 1%
- 15.4-inch TFT LCD control panel with intuitive touchscreen operator interface
- Communication: PROFIBUS/PROFIsafe, PROFINET, Ethernet, USB

Comparison of energy consumption

Energy recovery in the process with CSH
Energy consumption press drive PSH
Energy consumption conventional press drive

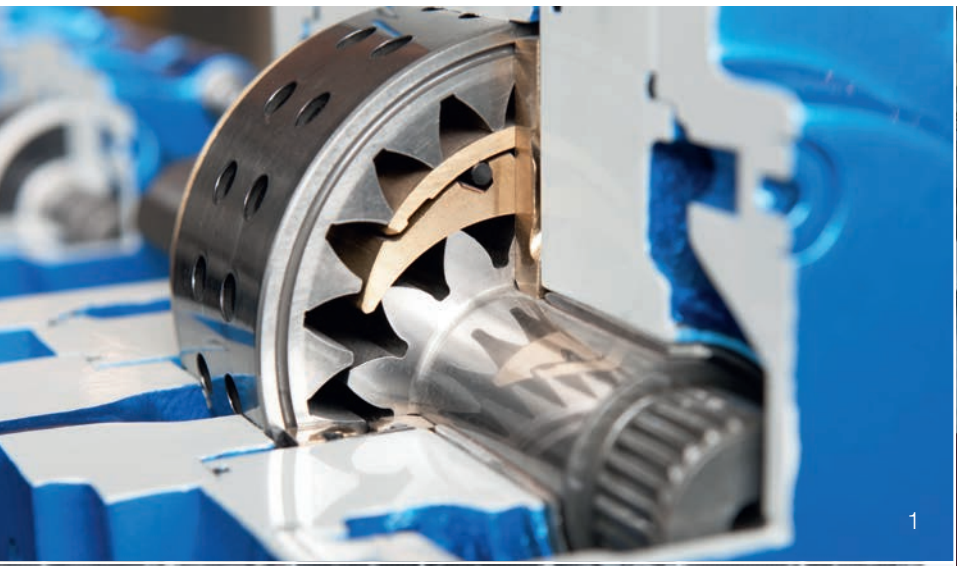
1 Cutaway of internal gear pump model IPVP
2 Servo pump
3 Cabinet

CSH components

Scope of delivery
- Servo motor pump group
- Cylinder
- Power pack (optimum filtering circuit, cooling,...)
- Accumulator
- Cabinet
  - Converter
  - Control Simatic S7
  - Software package
  - Control buttons
- Sensors
- Cable with a defined length for:
  - Sensors
  - Motor
  - Valves of scope of delivery
- Performance fluid PF-400 (For the press drive PSH, exclusive use of PF-400 is mandatory.)
- Software package
- Retrofit package
- Automatisation

Option
- Safety technology

Advanced scope of delivery
- Advanced safety features in Simatic S7 CPU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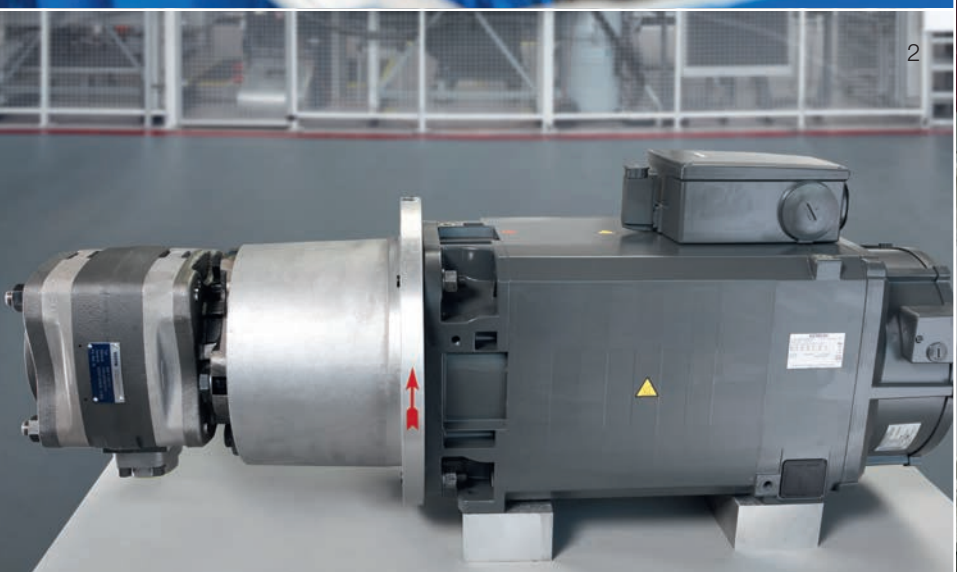
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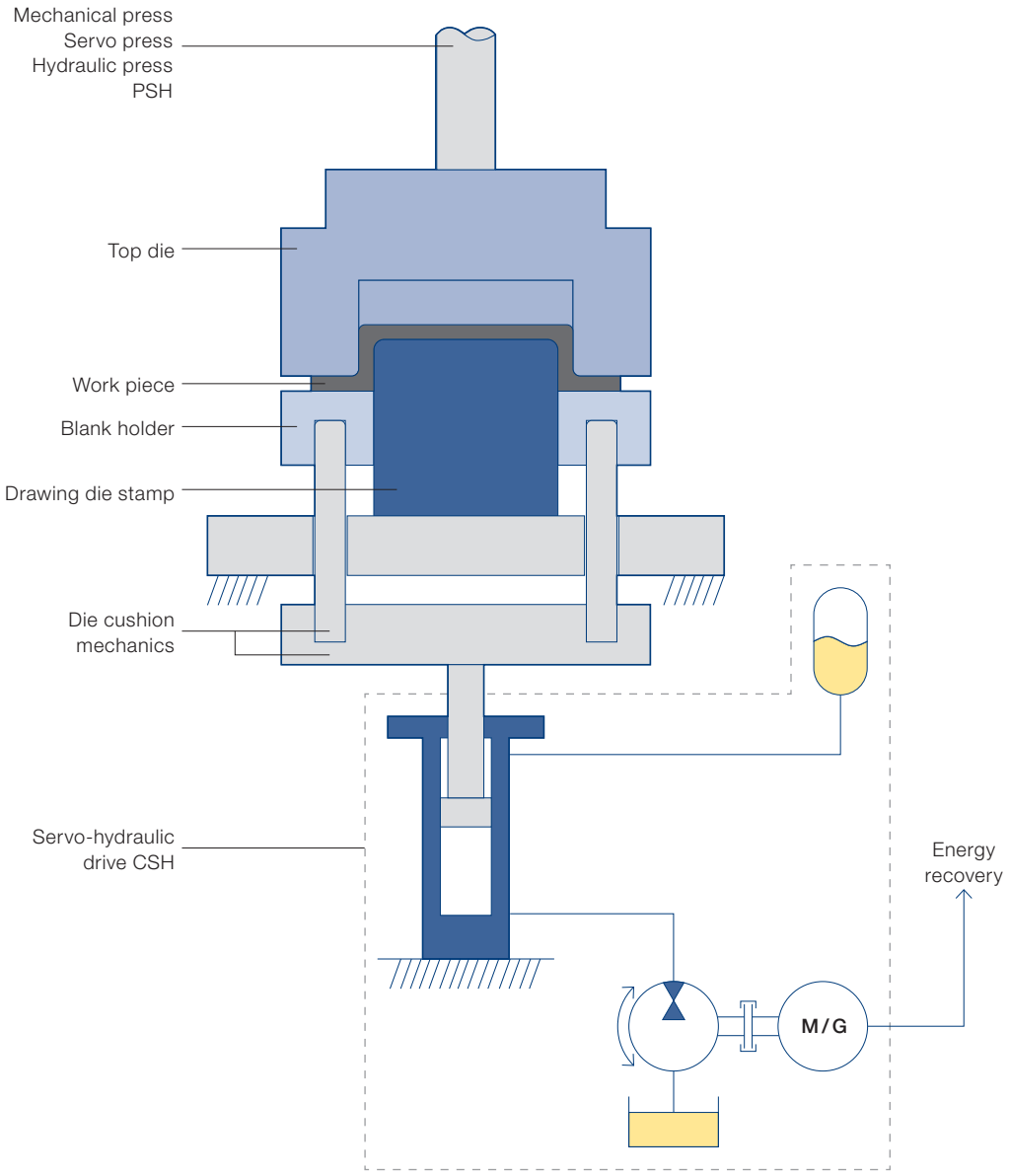
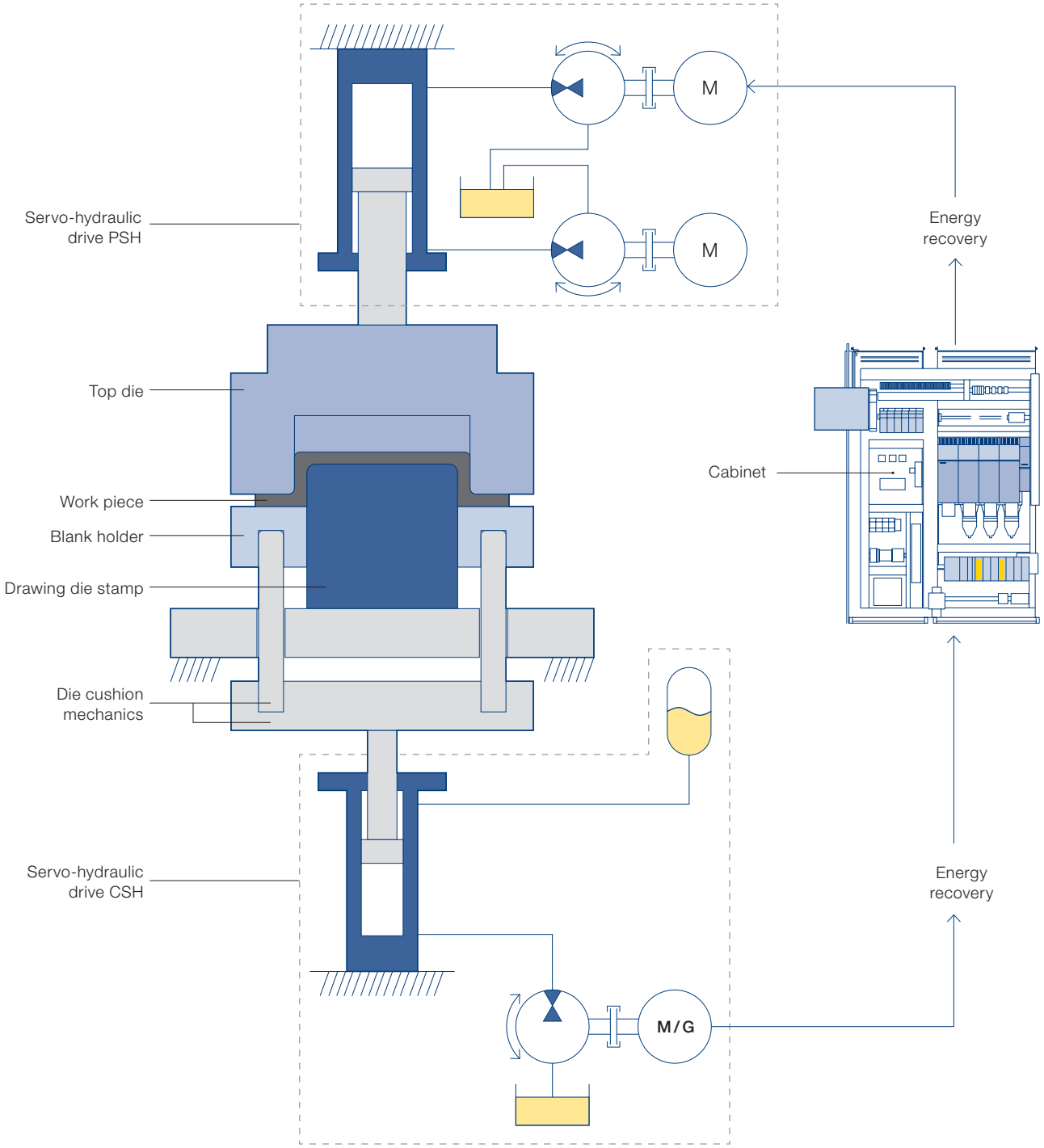
CSH operating principle



PSH-CSH combination, 80 % energy saving



Advantages using CSH

Features	Advantages
• Actively controlled servo pump with a servo motor that operates as a motor or generator • No classic valve and control technology	• Even the energy that the motion of the ram introduces into the die cushion can be recovered in the form of electrical energy • The energy efficiency of the die cushion drive is exceptionally high
• Control modes provided by the servo pump: – Position (freely selectable) – Speed over stroke – Force over stroke	• Design freedom for the entire deep drawing process with regard to the curves for position, speed and force (servo cushion!) • The adjustable blank holder force allows arbitrary characteristics of surface pressure – even decreasing or oscillating ones • Deep drawn parts can be fabricated with a reliable process
	• Pre-acceleration of the die cushion can be selected as desired (synchronization)
	• Decoupling the motion of the die cushion from the ram motion is easily possible after reaching bottom dead center
	• A part ejection function can be programmed
• (Servo) hydraulic solution	• The drive has safe, fast-acting overload protection
	• The number of wear parts is low; they have a long lifetime, are inexpensive and easy to replace
• Modular, simple design • Few components • Small oil tank	• This keeps the planning effort associated with system integration low • The drive can be scaled for virtually all deep drawing presses
	• The die cushion drive has a simple design
	• The oil volume in the system is up to 80 % less than for a conventional hydraulic die cushion drive
• The drive can be programmed via a 15.4-inch TFT LCD control panel with and intuitive touchscreen operator interface	• The drive has a high degree of flexibility and is suitable for all die cushion applications • The control system is pre-engineered with standard software
	• The HMI interface is convenient and modern • All relevant parameters can be programmed and visualized on site
• Integrated process monitoring	• The drive system has its own diagnostics and is Industry 4.0 ready
• Control algorithms are perfectly adapted to the hydraulics and electronics	• The die cushion drive is a complete, single-source solution • Simple and very fast startup

Benefits
+ You save up to 80 % of the energy costs compared to a conventional hydraulic die cushion drive + The press produces with a low cost/piece; you enhance your position over that of your competitors
+ With a reliable, repeatable deep drawing process, you increase the productivity of the press by up to 50 % – even more in individual cases + A controlled, reproducible die cushion force characteristics results in a defined material flow and avoids significant creases and cracks in the workpiece + Complicated deep drawn parts can be fabricated economically and with the fewest rejects + The forming depth of workpieces can be expanded considerably
+ The impact caused by the top die contacting the workpiece is minimal. The quality of the parts produced improves due to the reduced damage to the surface + The dies and the press itself experience a reduced load and have longer service lives. This reduces your operating costs significantly + Noise emissions lowered by up to 6 – 8 dB(A) reduce the effort and the costs for noise abatement
+ The die cushion with the workpiece can be moved independent of the ram + Following the draw process, no counter forces from the die cushion act on the ram. Reduced loading increases the lifetime of the die and the press
+ Your deep drawing press produces large and complicated workpieces without damage
+ You avoid significant damage to the press in the event of incorrect operation or a malfunction + Restarting is quick
+ The die cushion drive has long maintenance intervals and short maintenance times + The availability of the press increases
+ Short development times save you planning costs + The drive is ideal both for new presses and for modernizing or retrofitting
+ The drive is operationally reliable and has high availability + Low maintenance and repair costs
+ The small effort for oil management has a positive effect on operating costs
+ Integrating the drive into the press is fast, easy and economical + This keeps your startup effort and costs low
+ The initial training of your operating personnel is short + Fast, informative process visualization and monitoring is possible on site
+ Maintenance needs can be detected early and extremely quickly + Downtime of the press is considerably less + On-site service calls can be reduced by up to 70 %
+ Shorter development and startup times save you money

AFFC-Cushion control

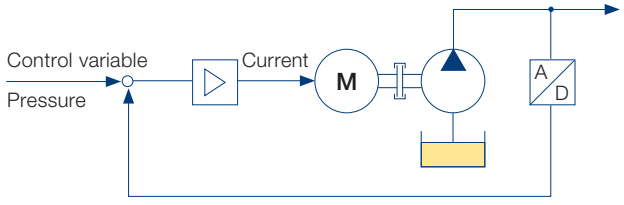
The process force of the die cushion is determined by the pressure in the working chamber. For pressure control the CSH uses the advantageous Adaptive Feed Forward Control (AFFC).

Well known historical methods (SoA) use the motor current as a control variable to finally control the pressure via the motor torque. These systems are less robust and are critically responsive to output side disturbances.

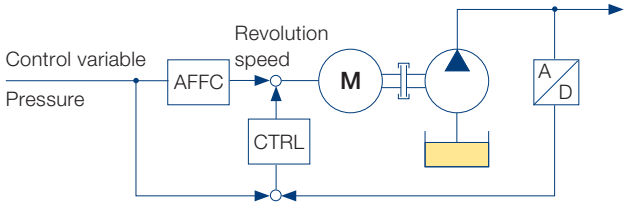
From the knowledge of the system components, the innovative AFFC calculates the motor speed as the control variable for controlling the pressure. Due to the adaptive component of the actual value signal, this regulation works extremely stable and robust against disturbances from the process.

Comparison control types

SOA



AFFC



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