Working With the Right Energy

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The achievement of finished parts in only one stroke and without scrap is the highest aspiration of the companies that produce components through the forging process. It is no doubt a high level to target, influenced also by working conditions that can hardly be kept under control, such as the temperature of the part, or environmental factors, such as the humidity of the air, that may alter the press functioning—not to mention the evolution of the materials to be forged, which more and more require systems equal to the task. Through the years, many technical innovations have allowed the screw presses to conform themselves to the market requirements (mainly regarding the quality of the part and to the efficiency of the process). From this point of view, one of the most recent evolutions is represented by the Direct Drive (DD) range of presses developed by Ficep, whose latest version is characterized by the presence of a system for energy recovery, which leads to a significant reduction in consumption in machines that are traditionally voracious users of energy.

From the Friction to the Direct Drive System

Ficep has been manufacturing screw presses for several decades. We have considerable experience in this field. An analysis of the difficulties that emerged during the different challenges we have faced made us realize that traditional friction screw presses did not guarantee constant results because the leather friction was subject to wearing and environmental factors.

The Direct Drive (DD) series presents, above all, a simpler construction with less components because the mechanical part bound to the motion transmission was completely removed. As suggested by the name itself, the brushless motor directly moves the screw: the relevant software control enables the speed adjustment as well as the possibility to handle it as both motor and brake, even if the term "current generator" would be more appropriate.

By matching the action of the permanent magnets of the brushless motor and the precise voltage management software, it is possible to control the screw rotation speed that determines the down stroke speed of the ram and, consequently, the relevant kinetic energy when it hits and forges the part. This control represents a key aspect in the forging process, as it is the quantity of energy transferred by the ram to the raw material that determines the deformation degree and the precision level of the forged part.

Precision and Efficiency

The Direct Drive system operates like a numerical control; it is sufficient to set the value of the speed required by the ram at the impact moment, and the system will automatically operate during the down stroke to accelerate or slow down the die's drop. In order to determine the process reliability, one detail is sufficient: thanks to the electronics supplied by Siemens, Ficep guarantees a 0.5% precision on the energy value of the ram at the end of the drop. This result could also be achieved due to the complete elimination of the motion transmission that had a considerable influence on the process variability, while simultaneously allowing simplification of the press maintenance activity. Ficep has introduced additional improvements in all parts of the press, such as new profiles for screws and nuts to reduce friction and the use of more compact motors with increased efficiency.

The close cooperation with Siemens and the will to bring constant improvements to their solutions recently lead Ficep to develop a new version of DD presses characterized by the presence of a Kinetic Energy Recovery System (KERS) to recover part of the energy used during the forging process. Thanks to the utilization of a second brushless motor, more compact but with a very high rotation speed, the energy that would normally be lost to brake the press is stored to be re-used in the following forging cycle, with total energy savings that, in particular conditions, can reach 60%.

The possibility to finely adjust the ram speed and to modify the relevant stroke makes these presses extremely versatile and attractive for a considerable number of applications. We have a complete portfolio from this point of view that covers all sizes. The DD presses can be used in the automotive sector and in agricultural and earth-moving machinery where a considerable portion is dedicated to the production of axle shafts for heavy transport.

In the aerospace and energy production fields, the high resistance of the titanium alloys, aluminum, and special steels for high temperatures requires considerable forging strengths, which makes Ficep's structurally sturdy presses particularly suitable for the forging of the relevant components.

The petrochemical sector requires the use of important press sizes to process flanges in special duplex and super duplex steels containing alloying elements that lose their characteristics when exposed to high temperatures. It is therefore mandatory to work the raw part at temperatures lower than those typical of the forging process, and with force and energy remarkably higher. Furthermore, Ficep can also boast a great success in the field of medical prosthesis (in this case, medium-small press sizes are involved).

Hydraulic and Mechanical Presses

Besides the Direct Drive presses, Ficep has developed other product lines to offer technology to the forging field, such as the realization of the hydraulic presses HF series, which comes in two versions: one with electrowelded structure and one with four columns (4C). The presses with monobloc, electrowelded structure offer a high stiffness with a natural predisposition to operate off-axis and with multiple dies; besides being used in the trimming phase, when the involved strength is not particularly high, we can also work as presses for really hot forging operations. The solution with four columns is particularly suitable for the reaching a double target: besides carrying out a first deformation of the material, allowing the following press to completely forge the part with less energy, it also performs a mechanic action to break and eliminate the scale produced by the oxygenation on the surface of the raw part during the heating and transfer from the heater to the press. In this way, the forging press can process the "clean" material and achieve a component with more precise geometric characteristics, thus extending the life of the dies.

In more recent times, Ficep started developing a third family of presses for the forging field: the MF series of mechanical presses. It is an advanced version compared to the classic mechanical press, which we decided to develop with innovative technical solutions to meet the strong market request, and is suitable for a wide range of applications. It is known that the mechanical presses have a faster cycle time compared to the screw hydraulic presses, even if the ram adjustment required to obtain a proper closing of the die is more complicated, with a setting time slightly higher than the screw/hydraulic presses. As a consequence, they prove to be winning for productions that require high volumes of components with small and medium dimensions, where the accuracy of the final part is not the essential requisite.

Complete Lines

Experience in the forging field led Ficep to approach this sector as a partner supplier of all necessary technologies to complete the working process, with the only exception being the heating systems, which can be integrated at the request of the customers. The manufacturing unit in Gazzada Schianno (VA) also produces machines to cut the bars (these can be disc saws or cold, warm, or hot shears) and supplies the automation to handle the slugs from the cutting area to the heating system, and then to the preforming or forging presses.

As the machines started becoming more and more accurate, the customers' attention moved to different phases of the process where the operator's activity could negatively influence the final result. This is why the automation spread so quickly - the automated systems always take the same time to bring the piece from the heater to the press, and therefore the piece is always processed at the same temperature. Today, even the lubrication of the dies is carried out with robots that distribute a uniform layer on the entire surface of the die, thus assuring an optimal sliding of the material on every area of the die. These operations are simple, but they ensure the preservation of quality for the entire production batch and the reduction to a minimum of the scraps, which represents the main target of Ficep's customers. Everything is designed to comply with the requirements concerning the new concept of Industry 4.0, allowing the machines produced by Ficep to face the new challenges of the future with enthusiasm. ■

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