Isostatic Press PI60/4 – the Next Generation

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After a fundamental revision and diligent model care, DORST TECHNOLOGIES presents the next generation of the proven, dry isostatic universal powder press PI60/4 for the production of rods, shafts, tubes, sleeves and balls made of technical ceramics, hard metal or other powdery materials.

For almost three decades now, manufacturers of ceramic, technical and hard metal powder materials have valued the reliability and performance of DORST isostatic presses. The robust press systems are used every day in a wide variety of markets and applications. Examples are pump pistons, shafts, axles, electrodes, battery sleeves, rods, nozzles, insulators, bearing balls, ferules, preforms and much more.

DORST's product portfolio is now divided into the IPM series for specific solutions and the PI series for every type of isostatic shaping. The standard range is supplemented by special isostatic machines, some of which also come from the field of tableware ceramics and have been further developed by means of technology transfers for special technical ceramic applications.

The PI60 series, with a closing force of 600 kN and isostatic pressures up to 2000 bar (29 000 PSI), is one of the machine groups that has been able to maintain its position on the market for the longest time in an almost unchanged design.

In the course of continuous further development and product maintenance, however, it was now time to fundamentally revise this type of machine and bring it up to the state-of-the-art.

One press – many possibilities

The strengths of the PI60 series are the universal application possibilities for isostatic powder forming, the compact, clearly structured design and the high rigidity of the press frame. Starting from the same basic machine, the optimum filling and demolding process for the most diverse pressed part geometries can always be installed by means of a modular tool system.

The simplest method fills the elastic die with powder and the upper part of the tool closes the pressing tool against the isostatic pressure. The pressed part is then simply pulled out of the die with the normal opening stroke of the main axis. This process is

Fig. 1 Isostatic press PI60/4 – the next generation

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Fig. 2 Modern graphical user interface on swiveling screen

very fast and not very demanding. The so-called lifting process is particularly suitable for light and smaller pressed parts and does not require any additional movements on the machine.

With the introduction of an additional movement for a press needle in the upper part of the tool, especially long tubes and thin-walled sleeves – also with inner contours and closed end – can be produced. The needle movement, which is independent of the movement of the main axis, allows the central mandrel to be brought into the final pressing position before the die is filled with powder and closed by the main axis. Depending on the design, the press needle can then be retracted independently during demolding by lifting it out.

By far, the most common method is ejection. For this purpose, the press is equipped with an additional movement below the press table, which ejects the pressed part upwards through the die after compaction. The process is particularly suitable for large and heavy compacts and can also be combined with the additional movement of the upper part. This is useful, for example, in the manufacture of ceramic insulators with an inner collar.

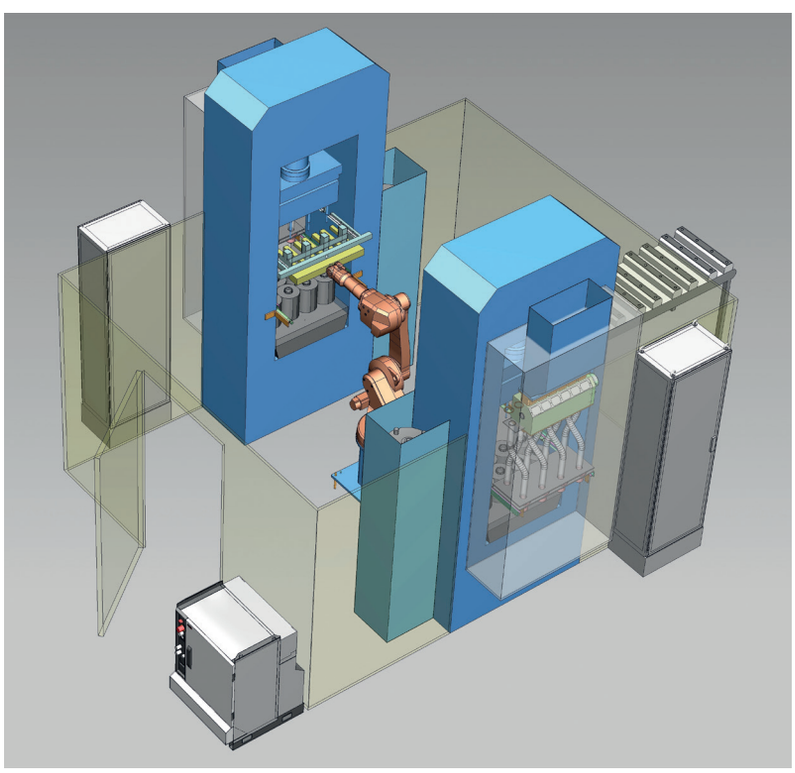

Fig. 3 Study of an isostatic manufacturing cell based on PI60/4

Compatibility with previous models

An essential requirement for successful redesign of the press was the greatest possible compatibility with existing customer tools and a similarly clear operator guidance as with the predecessor models. Operators of older machine generations should not have to make any major changes to a new press concept.

At first glance, a new PI60/4 can therefore hardly be distinguished from its predecessor, the PI60/2. The press frame and the installation space for tools are almost identical. Clamping and pressing forces are generated hydraulically and press axes are moved hydraulically. Like its predecessor, the new PI60/4 can be equipped with both single and multiple cavity molds.

The process of isostatic powder compaction using the CIP drybag process and hydraulic pressure intensifiers has also been retained. In the sense of a fully automatic production machine, fully automatic powder dosing and automatic removal of pressed parts continue to be among the characteristic features.

The result of continuous improvement

The next generation of isostatic universal powder presses presented here is the result of a diligent and carefully executed improvement process based on countless practical experiences inhouse and especially with active users everywhere in the world. All proposals have been structured, analyzed and examined for economic feasibility. Methodical engineering has made it possible to change tools almost 30 % faster

and at the same time achieve a high level of comfort. The set-up of a new press part by replacing the elastic die including the shaping steel parts and setting a new filling volume has also been considerably simplified for multiple tools.

In the course of the preliminary studies, it quickly became apparent that the next generation of presses could only be further developed with hydraulically controlled axes and a completely new control system. Today, all movements on the new PI60/4 are closed-loop position controlled. The isostatic pressure curve can also be programmed in a closed-loop controlled manner and allows compaction pressure curves in the narrowest tolerance bands.

The graphically supported visualization on a large-format color touch screen informs the operator at all times about the status and the running process of the machine. The control panel is installed above a long jib directly on the press frame and can be rotated to both the front and back of the press. This means that the control panel is always visible and within reach for all activities on the press. The option of remote maintenance via the DORST service router and optional interfaces for networking complement the overall system.

The hydraulic system of the PI60/4 has also been completely redesigned. On the one hand, significant energy savings should to be achieved and on the other, noise emissions should to be minimized as far as possible. Both objectives have been successfully achieved.

Flexible layout variants

With the idea to create a flexible double production cell of two isostatic presses around a central robot, the press frame and the hydraulic piping were designed in such a way that each press module can also be set up as a mirror image. This makes it possible to have flexible installation options for individual machines as well as so-called "twin cells" with a central hydraulic unit. Depending on the application, it is possible to place pressed parts on a conveyor belt via the robot or via a simpler pneumatic axis combination.

Fig. 4 Examples of isostatically pressed components

Outlook

The project has clearly shown that proven technology can still be improved and has potential through careful engineering. Designed as a universal machine, the new isostatic press generation PI60/4 offers the ideal platform for innovative tooling and production concepts for the manufacture of isostatically pressed parts of even higher accuracy and increased geometric complexity from technical ceramics, graphite, hard metals or plastics.

In connection with automation components and application specific powder filling technologies, the possibilities of the PI60 series are far from exhausted.

Summary

With the latest generation of the PI60/4 from the family of fully automatic CIP dry-bag presses, DORST TECHNOLOGIES has once again successfully met the high demands of its customers on a premium supplier for powder molding.

A proven machine concept has been purposefully revised and brought up to the state-of-the-art.

More performance with less energy input – higher flexibility with additional comfort during operation and tool change – precise process control through closed-loop controlled axes, and a closed-loop controlled pressure intensifier are just some of the features to emphasize the increased customer benefit.