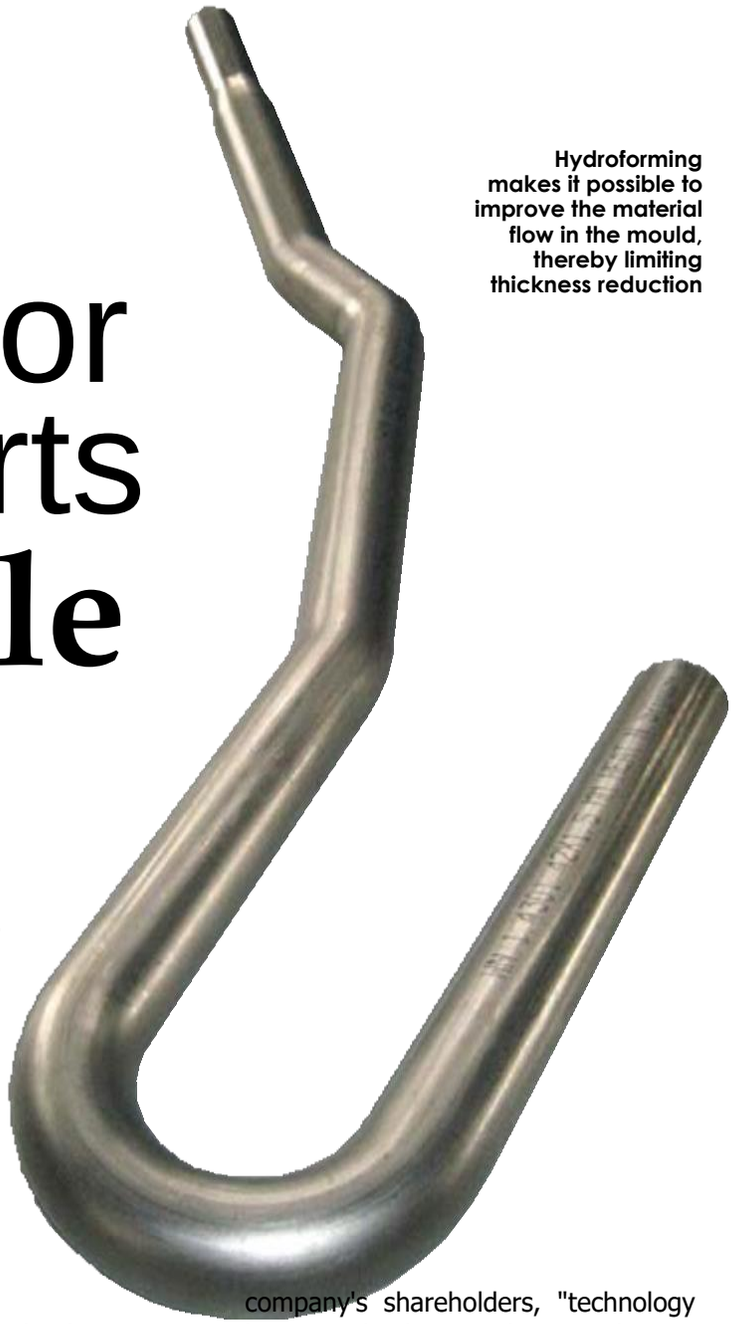
High-level production for complex parts and variable geometry



Hydroforming makes it possible to improve the material flow in the mould, thereby limiting thickness reduction

F.LLI NAVA OPERATES ON THE NATIONAL AND INTERNATIONAL MARKET IN THE CONSTRUCTION OF HYDRAULIC PRESSES FOR MANY FIELDS OF INDUSTRIAL APPLICATION, INCLUDING SHEET METAL AND TUBE HYDROFORMING

Eng. Andrea Nava
one of the shareholders of F.lli Nava

The hydroforming technology was developed by F.lli Nava with its first applications back in the 1980s, starting from the need to make aesthetic parts that were difficult to form using traditional deep moulding.

These installations, which are still productive today, have been complemented over time by others that are also integrated in robotised press lines for forming heavy components in the HVAC sector (pumps in particular).

Although it is a long-established technology, hydroforming still maintains its own niche in the market. What are the reasons from your point of view? What are its advantages over other technologies?

"Over time", says Andrea Nava, one of the company's shareholders, "technology has evolved together with an increasingly refined and monitored management of the forming cycle, in a 4.0 perspective. The key points that make it a successful technology are the possibility of improving the flow of material in the mould, thus limiting thickness reduction, with very important technical and economic implications.

Are there application areas where hydroforming has not yet expressed its value and found adequate interest?

«The technological benefits of this method allow for more accurate products, with less stressed material, not subject to residual welding stress typical of moulded and then composite parts,

with more uniform thickness, more regular surface appearance, more favourable dimensional characteristics. This is a more successful process than cast parts in terms of lightness, absence of blowholes, superior surface quality, and virtually no defects. With this technology, which has been successfully implemented in the motorbike exhaust and structural parts sector, as well as more generally in sectors requiring the production of tubular parts with complex shapes and variable geometry, it has been possible to achieve significant savings on the unit cost of the finished part, as a result of the many strengths of the developed solution. In the specific case of motorbike exhausts, the resulting part is a winner not only because of its cost optimisation and superior appearance, but also allows some

valuable extra horsepower to be "squeezed out" of the engine under the same conditions.

Through the absence of welds and the more fluid development of the geometry of the ducts, an outflow of combustion gases with lower pressure drops is obtained. These technological aspects, on the other hand, are applied with different specificity in different areas, ranging from the world of HORECA, for pots and pans and kitchen components above all, to that of the aforementioned HVAC, for pumps with undercut parts, up to the world of exhausts for high-performance combustion engines, and even aerospace. Considering that hydroforming partially overlaps with deep moulding, we can summarise by saying that hydroforming starts where other technologies mark time».

Highest operational flexibility and productivity

One of the various applications developed by F.lli Nava involves an 8,000 kN hydraulic press, used to close the upper half of the mould with vertical movement, of a pressure multiplier unit. This unit produces water at very high pressure, which is injected into the tube so that it adheres perfectly to the mould cavity, of two cylinders that actuate the thrust plugs, suitably shaped to make a seal at both ends of the tube being inflated. The machine built is presented as a flexible machining centre because of its special mechanical interface system, which is able to position the cylinders of the contrast caps with a large degree of flexibility. Consequently, customers are able to change their production in a very short time, following the cycles set by the market rather than producing for stock. The solution proposed by F.lli Nava is therefore characterised by maximum operational flexibility and high productivity, also as a result of special expedients implemented in the inflation cycle that save precious seconds in each moulding cycle.

All this is interfaced to the operator via supervision software. The culture of data, in Industry 4.0 terms, further enriches the performance of the installation: not only does the system produce very significant parts, but it also documents key processing parameters over time, enriching a computerised history.

From this, management indications can be extracted, as all commercial tools are now able to do, but also much more. In fact, many other significant technological indications about moulding trends and mould yields can also be obtained, including an assessment of the energy impact on production. Among the further technological innovations developed by F.lli Nava, the new process applied for tube annealing, necessary as an intermediate step in hydroforming, is also very important.

F.lli Nava's 8,000 kN hydraulic press, developed for closing the upper half of the mould with vertical movement, of a pressure multiplier unit

Is there room for "technological" development? What trends are there, if any?

«"Since this is a technology," concludes Mr Nava, "that changes the terms of the usual deep moulding process, its important potential is restrained by the need for a cultural investment before an installation and production investment. In fact, investing in an installation means investing in new technology, in the construction of dedicated moulds and in training to create know-how. The necessary experience on moulding equipment and process must be built up over time.

Which is something that not all users can afford for the significant installation and investment costs, and the impact on the organisation of production lines that have to be significantly revised. As new requirements emerge on even very well established component markets, there is room for the implementation of this technology that produces cleaner parts: in the mechanical sense, for example, consider exhaust systems without internal discontinuities that improve fluid dynamics; in the hygienic sense, consider medical and foodstuffs for example, where seamless parts do not create a receptacle for contamination of various kinds.

This is still a current and active niche, although the field of application at the moment is still limited compared to the deep drawing and very deep drawing, which have always been at the heart of our hydraulic press business.