Application of numerical simulation to reduce the flash of a hot forged automotive piece

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ABSTRACT

Through of an extensive background research on the application of numerical simulation forging process, we have found that works is mainly aimed at; analyze and resolve defects [1]; improve the design of the toolkit used in forming [2]; predicting the microstructure of the material in the different phases of forging process [3]; microforming simulation [3]; die wear evaluation [4]; or determining lateral forces in forging dies with close warped surfaces [5].

On the other side, afterwards five-year relationship with the industry, we know that, with the exception of a few companies, those systems are not used in Argentine forges.

Although, as Arfmann says [6], it is better to use them in new projects, as well the benefit of its use would be maximized by eliminating the standard uncertainty of the process of trial and error, as well as their associated costs, the using of simulation in parts already in production, can promote significant improvements.

The National Institute of Industrial Technology, through the Forging Group from INTI-Mecánica, has proposed to collaborate by introducing the use of this technology in local industries, considering the context in which they operate.

Consequently, in this work of industrial application, were analyzed using FEM software named Simufact.Forming, possible improvements about process of hot forging of a piece, that not requiring investment in machinery or in die design, and not increase production times.

To achieve this, an automotive piece was selected from various evaluated cases, basically for two reasons: because it had an excessive flash material, and the volume of production was significant for those who produced it.

The original process, in which two pieces are formed in two blows in a crankshaft press of 1000 t, the perimetral flash rate represented 94% of the final weight of the finished part, using as a starting material, a laminated bar ∅31,7mm x 178 mm.

Firstly, was reproduced the process as was usually done by simulation. Although, we worked on various improvement alternatives, especially on the size and shape of the starting material. The use of a square laminated side bar 25.4mm x 95mm, allowed to reach a virtual good part with a flash rate of 66%. The productivity was one piece per blow, like the original process. The theoretical formed load was 500 t, that ensures that the press will not be overloaded.

With a simple modification, the proposed process, produced a material savings estimated at 3.5 t / year. This modification will become an economical benefit to the company, such as for the production of several thousand additional pieces with the same quantity of material. This improvement was obtained without additional investment.

Finally, the results obtained from the numerical simulation were positively confirmed by experimental tests on the forging plant floor.

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