PEMSA Uses PAM-STAMP 2G to Reduce Stamping Die Design Time from 6-12 Months to 1 Month

THE CHALLENGE

To design a functional deep-drawing die in record time for an automotive customer.

THE STORY

PEMSA, a Mexican auto supplier, recently faced the challenge of designing a tandem die to build a structural reinforcement part for an automobile seat with a deep contoured shape. It is a challenging contoured shape part, made of high-strength steel, with a complex geometry, and constrained by the fact that the part spot-welded to several other parts.

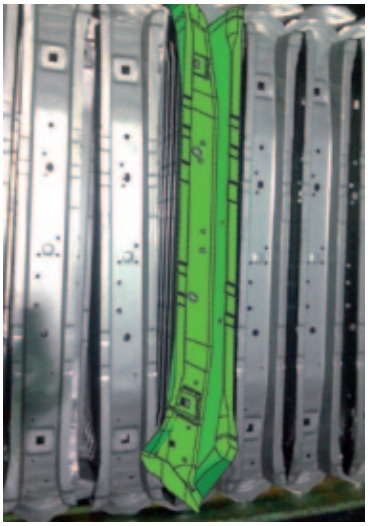
THE BENEFITS

"In one month only we developed a die design that solved the cracking problem without interfering with the spot welded surfaces. The key was PAM-STAMP 2G's ability to evaluate quickly and inexpensively the performance of alternative die designs. ***The die performed exactly as predicted by simulation. It's much faster to design and test a die as a software prototype.****"*

Sergio Luis Cacique Borrego,
PEMSA Engineer

PEMSA (Pintura, Estampado y Montaje S.A.P.I. de C.V.), a Mexican auto supplier part of the CIE Automotive Group, produces primarily pickup truck boxes for its international customers.

PEMSA engineer Sergio Luis Cacique Borrego was recently responsible for designing a die for an automobile seat structural reinforcement part. The part is challenging because it is made of high-strength steel and has a complex geometry that requires deep drawing. The die design was constrained by the fact that the part is spot-welded to several other components and the area that is welded must be nearly flat.



Seat structural reinforcement
(Green part is the virtual prototype)

The traditional method used by die designers to address this type of challenge is typically to design the die using intuition and experience, build it and run it on a press. Because of the difficulties inherent to this part, it's almost certain that the initial design would not have worked, most likely due to cracking in the area of the radii.

"Based on the trial results, we would have changed the design, sent the existing die to the machine shop for repairs, and tried it out again on a press," Borrego said. *"It would typically take about 3 months to fix the die. But the modified die would not produce parts that match the original design model so another 6 to 8 months would be needed for the design changes and obtaining customer approval. We didn't have anywhere near that kind of time in this application because the master schedule for the vehicle introduction could not be moved."*

Borrego made the decision to simulate the die with PAM-STAMP 2G prior to building the tool. **"We use PAM-STAMP 2G because it has demonstrated the ability to accurately simulate the performance of the complex dies that we use at PEMSA,"** Borrego said.

Final FLD
quality result

Initial geometry

Final geometry determined by stamping analysis

This software is designed to model the initial part and simulate all metal forming operations up to the finished product in order to forecast any potential thinning, wrinkling, twisting, and springback of materials and to develop trim lines.

PEMSA developed an initial four-station die design with the first two stations performing drawing, the third performing trimming and the fourth trimming and piercing. In the first forming operation, the tooling has a vertical up and down motion except for the last 25 mm before close when it moves at a 30 degree angle to reduce thinning in the corners.

SIMULATION HELPS GET DIE RIGHT THE FIRST TIME

PEMSA exported the tool geometry of the initial die configuration into the IGES neutral file format and then imported the geometry into PAM-STAMP 2G. They simulated the first drawing operation. The simulation results showed cracking around two small radii in the part.

PEMSA immediately thought of opening up the radii but saw that this might interfere with the surfaces to be spot-welded. So they performed a series of simulation iterations in which they changed the radii to determine the effect on cracking and any disturbing of the critical surfaces. PEMSA determined exactly how much the radii could be opened up without interfering with the spot welds.

"Besides saving time, computer simulation eliminates most of the cost involved in the build-and-test method such as performing repairs in the machine shop and tying up the press with die trials. Yet we have found that simulation can very accurately calculate the performance of the finished die. ***In this case, for example, the die performed exactly as predicted by simulation so we were able to get it into production in a fraction of the time that would have been required in the past.***"

Sergio Luis Cacique Borrego, PEMSA Engineer

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ABOUT ESI GROUP

ESI is a pioneer and world-leading provider in virtual prototyping that take into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. ESI's solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 750 high-level specialists worldwide covering more than 30 countries. ESI Group is listed in compartment C of NYSE Euronext Paris. For further information, visit www.esi-group.com.

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