



FORD ENHANCES MANUFACTURING EFFICIENCY

ALTAIR® KNOWLEDGE STUDIO® SPEEDS STAMPING PROCESS SELECTION INCREASING FIRST-TIME-THROUGH RATES

Background Information

Sheet metal stamping is fundamental to the automotive manufacturing industry. A vast array of different tool, die, and process combinations are employed to create an equally diverse array of components. Traditionally, identifying the optimum stamping process for a given part design has been a labor-intensive and time-consuming task that relies heavily on the stamping engineer's knowledge and skill level. To address this issue, Ford Mexico began documenting successful metal stamping production runs over a 5-year period. Management's goal was to capture in-house domain knowledge and best-practices to explore ways to speed the selection of the best stamping process for future production runs to enable business benefits including increased plant efficiency and part quality, reduction of scrap material, and the ability to rapidly train new personnel.

About the Customer

Ford Motor Company, a Fortune 50 automotive company, operates plants all over the world and produces millions of vehicles every year. Quality, efficiency, and time-to-market are all critical to its profitability and sales growth.

More than 30 years ago, Ford began working with Altair to support the company's product development activities. Today, the company employs Altair software globally to support the development of Ford cars, trucks, and heavy equipment.

90%
ACCURACY OF
AUTOMATED STAMPING
PROCESS SELECTION

INCREASED
FIRST TIME THROUGH
(FTT) RATES

REDUCED
REWORK TIME

Their Challenge

In many production facilities, there are multiple sheet metal stamping processes available to form nested and individual parts. These include progressive, transfer and tandem press lines. For a given part design, many factors are involved to determine the best or most efficient stamping process such as the material type, thickness, part width, and desired surface finish.

The success or failure to select the right process relies heavily on the experience level and expertise of the manufacturing process engineer. However, growing design complexity, non-conventional material types, and numerous process combinations can challenge the most senior process engineer requiring a labor and material intensive trial-and-error prove-out process.

Material utilization is a particularly critical benchmark. Most automotive plants expect around 60% material utilization in their stamping mills. The remaining 40% is wasted. Ford's objective was to improve these numbers, while simultaneously improving the selection of the right stamping process the first time, and increasing First Time Through (FTT) rates.

To move towards achieving these goals, Ford Mexico began documenting and amassed a valuable asset: vast quantities of clean data associated with their successful production runs. Spanning a 5-year period, process engineers recorded successful stamping processes for thousands of parts. Captured in this historical data were valuable insights but the question now was how could they use this information to help automate and guide the selection of best stamping process for a given part design.

Our Solution

First learning of Knowledge Studio through an Altair technology briefing, Ford Mexico approached Altair to explore the possibility of applying Altair's machine learning and predictive analytics solution to support their business objectives.

Leveraging the data Ford collected for over 3,000 stamping processes identified as being representative of future requirements, Ford's stamping domain experts and Altair's solution architects collaborated to develop an accurate, reliable machine learning model with Knowledge Studio.

Knowledge Studio offers 15 different machine learning models allowing users to explore, select and train the model that best fits their data. Using subsets of the data, the team ran a series of tests to determine which was most effective. With an accuracy rate of over 90%, the decision tree model produced the most consistent results. In the process, a surprising – and valuable – discovery was made. In terms of selecting the optimal stamping process, the most important factors are the overall dimensions and thickness of the finished part. Alone, these factors are not enough to make a final decision, however, when combined with all the other datapoints, Knowledge Studio's machine learning algorithm provided Ford with results that are close to 100% accurate.

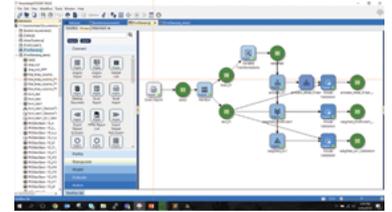
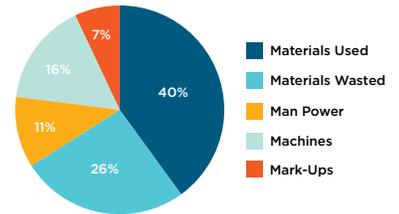
Results

The machine learning predictive power of Knowledge Studio proved to be highly accurate and successful in largely automating stamping process selection. By minimizing manual trial-and-error process validations and rework, more time was available for stamping process engineers to address the most difficult and complex part designs further enhancing production efficiency and business value.

Overall the projected throughput increased by a factor of three and, increased FTT rates resulting in reduced rework time – all accomplished without increasing resources.

In addition, the Knowledge Studio machine learning model was effective in capturing Ford's in-house domain knowledge to support a faster learning-curve for training of new personnel.

To learn more, view the video presentation at altair.com/resource/driving-manufacturing-decisions



TOP: Wasted (or scrap) material represents roughly 26% of the total cost to produce a stamped part. Reducing wasted material and increasing FTT rates directly benefits bottom line profitability.

BOTTOM: Knowledge Studio streamlined the selection of the optimal stamping process for new sheet metal formed parts.