

Toxic Free Metallization process for plastic surfaces



3rd PRESS RELEASE

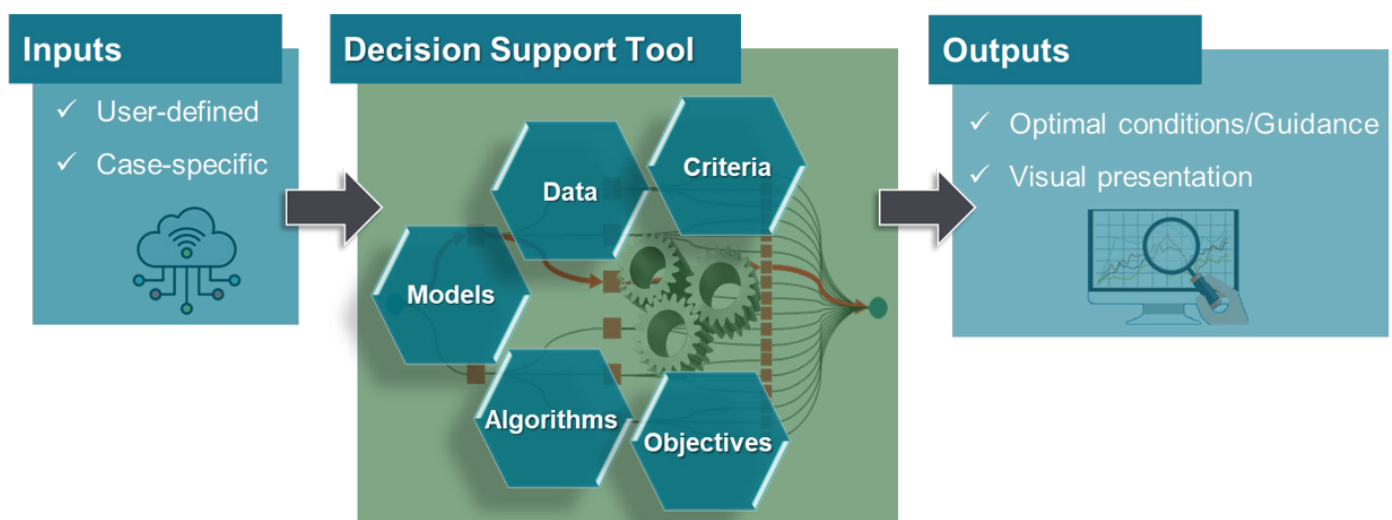
A note from the Decision Support Tools developer of FreeMe

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The recent advancements in the performance of computational systems and mathematical modelling allow us to build virtual assistants and improve decision-making at almost any level of everyday life. We could simply name these assistants as Decision Support Tool (DST), which consists of any computer-based application used to improve our capabilities and impact our everyday decisions. Now, we can analyze very large and complex problems and identify better solutions. We use DSTs every day. An example is the navigation systems that we use in our mobile phones and cars; they find the best routes to reach the requested destination. From

this example, we could figure out how these systems work: (a) they receive a request as an input; (b) they use mathematical models and data to process the request; and (c) they return a better, or best, solution for us.

As a step further, this decision-making assistance is of tremendous importance for the industry, where the engineer faces numerous large and complex problems, like the design of an industrial process and its operating conditions, scheduling multiple operations, and even the evaluation of technology to prepare an investment plan. DSTs are here to make propositions on these requests based on the target specifications and objectives



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set by the engineer. An example could be the reduction of a chemical's concentration in the plating industry to reduce human toxicity and resource depletion environmental indicators. However, such a decision will

affect process performance; thus, other parallel modifications should be considered (e.g., the increase of the plating time, or concentrations of other agents) to reach maximum performance.



In this scope, there are different modelling approaches to approximate and solve the different types of problems based on the data and knowledge domains of the problem. The DST modelling approaches include: model-driven, user interface, communication support, data-driven, knowledge-driven and database management Decision Support Tools.

In the FreeMe project, we face the development of two advanced technologies for Plating on Plastics (PoP) based on spraying or etching of the plastic surface before plating the metal coating. Each technology (spraying

or etching) holds several processing stages and challenges in the design of operating conditions. Moreover, the two “alternative” PoP technologies are expected to best fit into different applications featuring different specifications. In FreeMe, we address PoP in aerospace, household appliances and car compartments. So, our DST will assist plating shops in adapting and optimizing the appropriate FreeMe technology (spraying or etching) and its operating conditions with respect to requested design specifications and the type of items to be plated.

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The FreeMe DST follows a model-driven approach. We use state-of-the-art models and regression models based on experimental and in-silico data. When the case is to optimize a FreeMe technology, the DST returns the best operating conditions to tune the plating shop for the incoming PoP order. For instance, this could be the etching time and agents' concentrations to achieve the desired surface specifications (e.g., adhesion of metal coating). A step further, the DST can be used to evaluate which of the two (spraying or etching) technologies best fits the incoming PoP order. The FreeMe DST processes the user-defined input data (e.g., product specifications) by employing process simulation models and a factors database to



translate decisions on operating conditions into objectives. The end-user (a plating shop) can set specific goals in optimizing single or multiple objectives including operating costs, environmental impacts, or safety. The FreeMe DST will be demonstrated and be available for end-users by the end of the FreeMe project, in mid-2026.

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