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The DFM process generates a great deal of valuable data. **André Eichhorn** explains how to bring that valuable information together in a structured fashion

Integrate your DFM data

The early phase of the design for manufacturing process is not only important in generating a good component design that lends itself to effective production. It also allows the engineering team to collect a considerable volume of valuable information for the next phase of the product development process - designing and building the mould tools.

As part of the DFM process an analysis of the tool setup will have been completed to determine what the gating conditions will look like. And a mould filling study will have indicated the appropriate venting requirements and show cooling times, distortion issues, clamp force requirements, shear rates and other significant processing values. This data allows the engineering team to make calculations on cycle time, part shrinkage, injection moulding machine size requirements, and mould tool dimensions. It is now vitally important that these findings, calculations and requirements for the mould tools are collected in a structured way.

The best way to manage this data collection is in a Tool Specification sheet. Such a document provides the ideal means to bring together all the information required for the subsequent mould production stages. The Tool Specification will carry all of the essential information required by the toolmaker to produce a quote, as well as to design and build the mould.

A typical Tool Specification sheet will be structured as follows:

1) General part information

This area will contain information on the component itself. This will include names, numbers, materials, cycle time, shrinkage factor, and the like. The general part information becomes even more useful if the 2D part drawings are not available, which is not unusual at the early stage of a project.

2) Mould tool information

This section of the Tool Specification will include information on all mould tool-related areas. It will not only specify the tool steels, hardening, coating and coating areas but will also show the number of cavities, the number and type of sliders and lifters required, and the tool layout to be used. Information on anticipated hotrunner systems would be found here as well.

Figure 1 shows a schematic tool layout with gating information. This ensures the tool designer has everything on hand to start the design once the component design is released for tooling. Figure 2 shows the specified areas of marking on the component geometry, which most often will be overlooked at the tool concept phase. This is because the position of markings is typically considered at a later stage, generally while 2D drawings are being created. The problem that can often then arise is that, especially for smaller components, there is not enough space available to get datum stamps, material information or

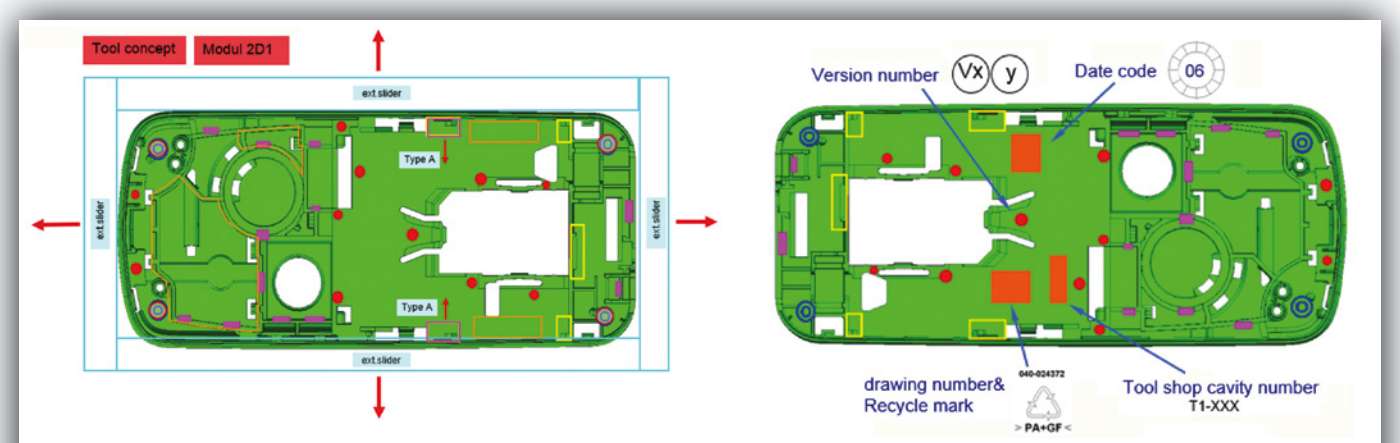
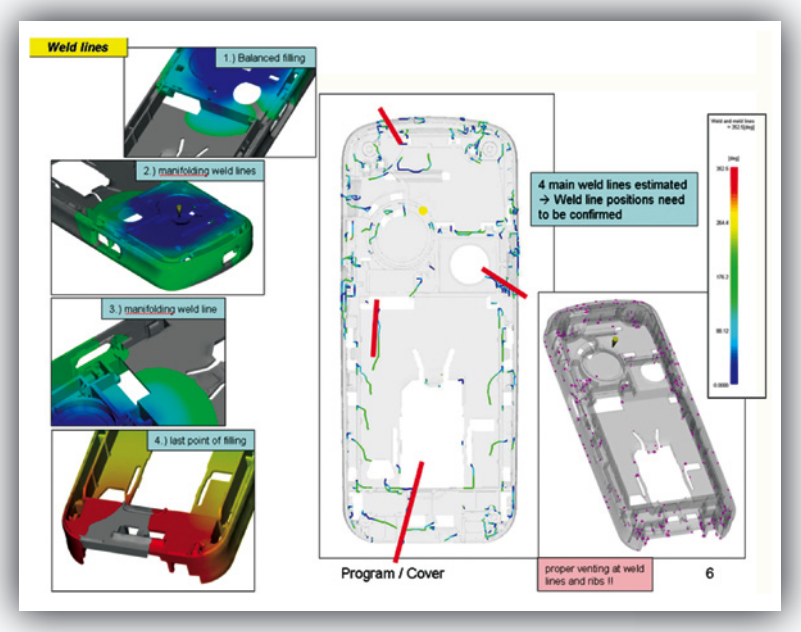


Figure 1: A schematic tool layout from an example Tool Specification sheet. **Figure 2: Required tool marking indicated on the component**

the recycle symbol placed. Sometimes it is found that a marking that is either embossed or recessed on the component is located in the area of a lifter or slider-movement - looking at the graphic would make the tool designer aware of the positions and make sure that this can be balanced this with ejector, slider or lifter locations and even cooling lines.

Depending on the completeness of the 2D drawings, other information on the surface structure of the component can be added as well so that the tool designer can also consider separate inserts to allow high gloss or industrial polishing in certain areas of the tool. And the most important page for security of filling of the component would be one carrying the venting information provided from the flow study, as shown in Figure 3.

Figure 3: Venting information can also be included in the Tool Specification



3) Equipment Specification

This part of the Tool Specification brings together all information related to the equipment required to produce the part and any special considerations that must be taken. For example, it will look at the type and size of moulding machine to be used in production, as well as the robotics required for part removal. Drying equipment and mould or part cooling and other temperature control technology can be specified at this point as well.

Specific requirements for mould tool qualification can also be laid down in this section, as well as data on the number of sample parts to be delivered and/or measured, at which place the tool needs to be validated, and what acceptance criteria must be reached before tool transfer into production is authorised.

4) Commercial Information

Most customers will also include some commercial information as they will use the tool specification sheet for the RFQ phase. All mould tool related deliverables will be specified, such as the full set of drawings to be delivered, sampling phases and the number of samples, parts or production runs to be made.

The Tool Specification sheet can, in fact, be used for a number of different tasks. However, looking at it from a purely technical perspective, it is the perfect place to bring together and organise all the data collected during the DFM phase. The DFM records, mould filling studies and other reports can be seen as working documents - the Tool Specification sheet is a record showing in one view all of the final decisions made during the DFM process.

About the author:

André Eichhorn is general manager of Germany-based AST Technology. This is the latest instalment in a series of articles in which he discusses how product manufacturing problems can be overcome at the outset of a project by the intelligent application of Design for Manufacturing techniques. You can read the most recent articles in this series **here**, **here**, and **here**.