ABOUT SOLIDWORKS COSTING MODULE FEATURES

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Abstract: In this paperwork is presented the SolidWorks analysis of costing, using Simulation Costing module. There are presented the settings that have to be done for such analysis and the results shown by this software module. The elements that are taken into account are specific to costing templates in SolidWorks, but can be adjusted for the specific costs of a given factory.

Keywords: SolidWorks, Costing module, machined parts, manufacturing costs.

1. INTRODUCTION

In addition to various modules in SolidWorks, as described in [1] and [2], Costing module was added in 2012 version and has the capability to perform a preliminary cost study, that will help make important decisions based on the cost of the part, and can lead to optimizing the design and make a given factory to became more competitive.

When this module was first introduced was limited to Sheet Metal and Machining. From SOLIDWORKS 2015 this capability was extended to include additional areas: Sheet Metal, Machining, Casted Parts, Multi-Body, Plastic Molded Parts, 3D Printed Parts, and Weldments.

The Costing module is based on a series of templates. The template is where one is able to specify the material being used, the manufacturing process (such as cutting, drilling or milling), the manufacturing method (such as machining, casting, injection molded, etc.) and the costs associated to each of these categories and operations. In addition to the standard manufacturing operations one is also allowed to add in custom operations such as packaging, painting or cleaning.

The Costing module can be used to estimate part costs or can be used for producing quotes. If this module is used for an estimate, there are made some general assumptions. Estimates give the user the flexibility to run several scenarios (such as removing features, changing materials, or using different processes). Creating accurate quotes from the part requires the templates to contain accurate information for the materials, processes, and other associated costs. The Costing module can create a faster, more accurate quote than many traditional approaches, eliminating the use of spreadsheets, counting of features, and estimating material removal.

Here is a short description of the capabilities available in the costing module [3]:
Sheet Metal Parts – This module feature will automatically recognize the native sheet metal feature of a part, such as flanges, bends, or forming modules. Holes and cuts will be recognized as manufacturing paths for operations such as laser, water jet, and plasma cutting.
Machined Parts – This module feature will calculate the removal of material from a stock block. Parts are drilled, milled, or turned to get the final shape.
Parts that are made from Plates of steel also incorporate laser, water jet, and plasma operations.

*Casted Parts* – This module feature will determine the cycle time base on the volume of the part. SOLIDWORKS software will determine the cost of the material, and the cost of the manufacturing, but the cost of the mold has to be provided by the user.

*Plastic Molded Parts* - This module feature will determine the cycle time based on the volume of the part. SOLIDWORKS software will determine the cost of the material, and the cost of the manufacturing, but the cost of the mold has to be provided by the user. The module does account for a hot runner mold or a cold runner mold.

*3D Printed Parts* – This module feature will estimate the time required to lay down material and the cooling time between layers base on the volume of the part. The module will calculate the cost of the material and the cost of manufacturing, based on the template.

*Weldment Parts* – Weldments include multi body and single body structural components, and the module will calculate the components as extruded parts. If a multi body template is used, weld bead and fillet bead cost information can be accounted for.

It has to be underlined that the Costing module is only as accurate as the data provided in the templates. SOLIDWORKS software does provide some default templates, but it is best to create custom templates based on manufacturing costs in a given factory.

### 2. COSTING MODULE TASK PANE

To begin working with Costing module, open a part and click on the Costing module icon (on Evaluate CommandManager tab) or menu Tools > SolidWorks Costing.

In figure 1 is shown how to begin Costing analysis applied on some part model.

![Costing icon for beginning analysis](image)

Fig.1. Costing icon for beginning analysis

When you have a part open, the Task Manager tree appears in the left with the Operation groups to let you check or modifying the part's technology, as it shown in figure 2, and in the right you have the Costing manager interface, to let you take the necessary steps for the analysis [4].

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2.1. Machining Template

*Template* – Let choose an existing machining template from File Locations.

*Launch Template Editor* - Opens the Costing Template Editor for creating or editing own Costing templates (figure 3).

2.2. Material

*Class* - Sets the class of material based on the material that was set for the part. This is automatically selected if the part has a material already applied.

![Fig. 2. Costing (Machining) manager interface](image)

![Fig. 3. Costing template editor](image)
**Name** - Sets the material based on the material of the part. This is automatically selected if the part has a material already applied.

**Material cost** - Displays the cost defined for the material at the selected thickness in the template. If you override Material cost, the text box appears in yellow and you can click Reset to Default Template.

### 2.3. Stock Body

**Type** - The stock body selection is critical. It determines the types of machining operations used to remove material from parts. It can be selected one of the following:

- **Block** – Estimates cost based on manufacturing the part from a block of material. The software assumes that milling and drilling operations are used to create the finished part. The initial block dimensions are for the fitting block around the model.

- **Plate** - Estimates cost based on manufacturing the part from a stock plate of material. The software assumes that a combination of 2D machining operations such as waterjet, laser, and plasma cutting, as well as milling and drilling operations are used to create the finished part. The stock plate size is determined by the largest surface area of the part. When you select Plate, the plate Size and Thickness from template are displayed.

If no thickness values in the template match the part thickness, the closest thickness value in the template is selected, and a warning icon indicates that the thicknesses differ.

- **Input specific size** - (Applies to Block stock bodies.) Sets the X, Y, and Z block dimensions to add stock to the tightest fitting stock faces.

- **Position** - (Applies to Block stock bodies when Input specific size is selected and when you add stock to the tightest fitting stock face.) Sets the offset values for the block (-X, -Y, -Z and +X, +Y, +Z). It does not affect the overall block dimensions.

- **Additional stock on** - (Applies when Input specific size is cleared.) Sets the block offset values (-X, -Y, -Z and +X, +Y, +Z). It does not affect the overall block dimensions.

**Preview stock** - Shows a preview of the stock body in the graphics area.

### 2.4. Quantity

- **Total number of parts** - Number of parts to be manufactured (initially is set to 100).

- **Lot size** - Number of parts to be manufactured per run.

### 2.5. Shop rate

**Shop rate** - Sets a cost per hour to determine the cost of all manufacturing operations regardless of what machine is used. This value overrides all costs related to machines and labor in the machining template.

### 2.6. Markup/Discount

Adjusts the material cost or the total cost using a percentage factor. A negative value creates a discount, and a positive value creates a markup. For example, you can increase the cost by 10% of the material cost which gets added to the total cost. The -10% will reduce the cost with a negative percentage. It can be selected one of the following:

- **% of Total Cost** - Increases the cost of manufacturing based on a percentage of the total cost.

- **% of Material Cost** - Increases the cost of manufacturing based on only the material cost.
3. COSTING ESTIMATION PER PART

In the lower part of Costing Pane is displayed the result of costing analysis (figure 4 and 5).

![Costing analysis result](image_url)

**Fig. 4. Costing analysis result**

![Costing analysis result detail](image_url)

**Fig. 5. Detail of costing analysis result**

*Estimated Cost Per Part* - Displays the total estimated cost of the part. The cost is constantly updated based on any changes made.
Comparison - Displays a bar chart for the Current and Previous costs or the Current and Baseline costs. If changes made to the part decrease the cost, the Current bar is green and the % difference is negative. If changes made to the part increase the cost, the Current bar is red and the % difference is positive.

Set Baseline - permits to set a baseline cost for comparison. If the design is changed later on, the cost is compared to the baseline cost. When is set a baseline cost, any changes to the part are considered Current and the difference is displayed.

Breakdown - Displays the cost and percentage distributions for the major contributors of the total cost:

- Material - Cost of the material based on the weight of the material used.
- Manufacturing - Total processing cost, including setup, machining, and additional operations.
- Markup or Discount - Adjustment specified in Markup/Discount.

Generate Report icon - Creates a report of the Costing data in Microsoft Word. If a report is already generated, one can click Update Report icon.

Send Report icon - Sends a report of the Costing data using the system default email application.

4. CONCLUSIONS

As it can be seen, SolidWorks Costing module provides almost real-time feedback on costing of a part in terms of material and manufacturing (technology) modifications. Results appear in the Costing Pane, which updates dynamically with any changes.

By following the steps and the settings described in this paper, as stated in [5], one can perform a study of costing of parts designed, and by various modifications of options to check the impact on the part cost. This can be useful to estimate part costs or can be used for producing quotes, and thus make a given factory to became more competitive.

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