

ABOUT DETAILED FEATURES OF SOLIDWORKS COSTING MODULE

prof.PhD.eng., Cătălin IANCU,
Engineering Faculty, "C-tin Brâncuși" Univ. of Tg-Jiu, ccgnew@gmail.com
Sen. Staff Scientist Yuriy GUTSALENKO
Nat. Tech. Univ. "Kharkov Polytech. Inst.", Kharkov, Ukraine

Abstract: In this paperwork is presented some detail features of the SOLDWORKS Costing module. These features allow the designer to make some decisions adjusted for the specific costs of a given production workshop, that can lead to more efficient design and lower costs, being an important activity of CAD/CAE integration in 21-st century CIM (Computer Integrated Manufacturing) production.

Keywords: SolidWorks, Costing module, machined parts, material cost, manufacturing cost.

1. INTRODUCTION

As previously specified in [1] every new version of SolidWorks introduces new modules or expand the capabilities of existing ones. So as described in [2] and especially [3], from SOLIDWORKS 2012 was added *Costing module* with the capability to perform a preliminary cost study. This module can help make significant decisions based on the estimated cost of the part, and thus can lead to optimizing the design and even make a given manufacturing process to become more efficient.

As described in [1], "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*".

Costing module in SOLIDWORKS is based on a series of templates from where it can be specified 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. Besides to the standard manufacturing operations it can be added some custom operations such as packaging, painting or cleaning.

Costing module can be used to estimate part costs, based on some general assumptions and templates. By estimating the cost can be run multiple scenarios (ex.: removing features, changing materials, or using different processes). For creating an accurate cost of the part the templates must contain accurate information for the materials, processes, and all other associated costs. *Costing module* can create directly in SOLIDWORKS a faster and more accurate estimated cost than many traditional approaches, eliminating, at least in this phase, the use of spreadsheets, counting of features, and estimating material removal.

The *Costing module* is only as accurate as the data contained in the templates. The default templates in SOLIDWORKS offer some data, but it is always best to create custom templates based on material/manufacturing costs in a specific factory.

2. PERFORMING COSTING STUDY – DETAIL FEATURES

The presentation will be performed to an *end shaft* made of USt-42-2, DIN 17100, and the equivalent chosen in SOLIDWORKS is AISI 1045 steel.

For beginning working with *Costing module*, the part file is open and then click on the Costing module icon (on Evaluate CommandManager tab) (fig.1) or menu Tools > SolidWorks Costing (fig.2).



Figure 1. Costing icon for launching *Costing module*



Figure 2. Costing menu for launching *Costing module*

At this moment, the *Task Manager tree* appears in the *left* with the Operation groups, for checking or modifying the part's technology, and in the *right* appears the *Costing manager interface*, for taking the necessary steps for the analysis [4].

At this stage appear the details that can influence very much the estimated cost. In *Costing manager* there are fields that guide you to the process of estimating costs.

Template – It can be chosen an existing machining template from File Locations.

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



Figure 3. Costing template editor

Material - Class - the class of material is based on the material that was set for the part. As specified before is AISI 1045 steel, cold drawn.

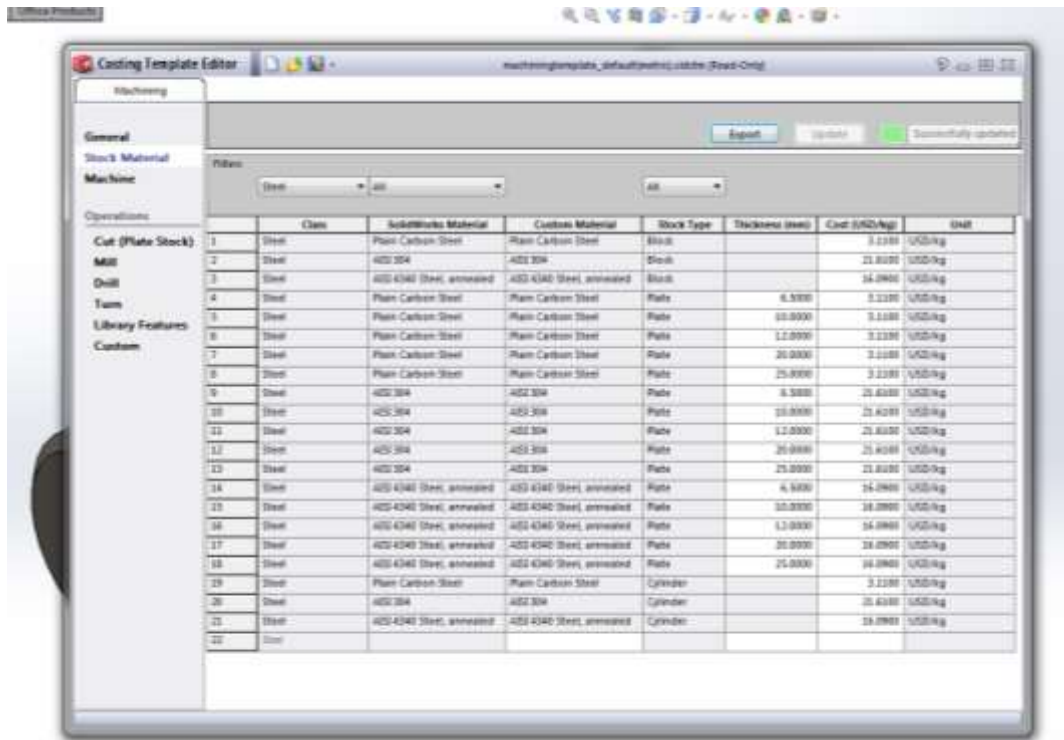


Figure 4. Choosing stock material

Machine - Sets the type of machining, as a wider class. It can be chosen from turn, mill or drill (fig.5).

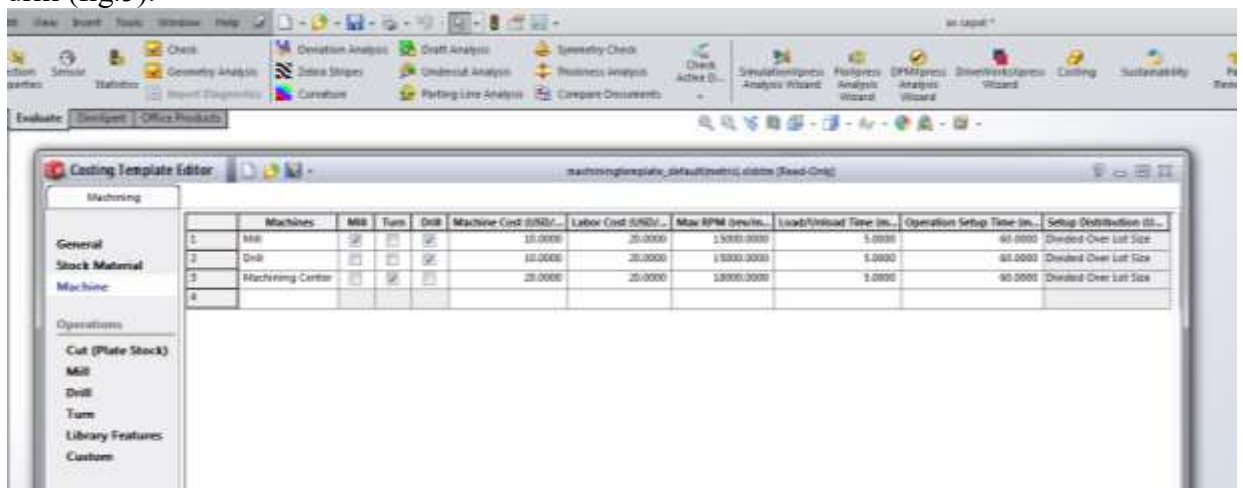


Figure 5. Choosing type of machining

Machining parameters – In figure 6 is displayed the dialog box from which you can choose the precise type of machining and modify various parameters of machining, as Fr (feed) S (speed) and d (depth of cut).

Block – The stock is machined by milling and drilling operations to create the finished part. The initial block dimensions are surrounding the model.

Plate – The stock is machined by a combination of cutting operations such as waterjet, laser, and plasma cutting, followed as milling and drilling operations to create the finished part. A warning icon ⚠ indicates if no thickness values in the template match the part thickness.

Cylinder – The stock is machined by turning phases. It is specified D-diameter and L-length and eventually additional stock for safe machining (+D and +L).

Input specific size – Let you input D and L, other then the values determined from geometric model.

Position – Let you specify the origin of stock relatively to part and it does not affect the overall stock dimensions.

Additional stock on – Let you specify additional stock as processing addition.

Preview stock – Let you see a preview of the stock relatively to the part in the graphics area.

At this stage one can see already an estimated cost per part (fig. 8) in which material represents 27% and manufacturing 73%. That represent a good ratio, meaning the stock is well chosen.

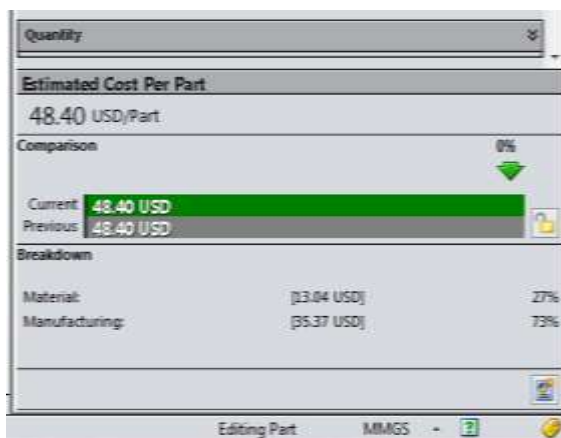


Figure 8. Detail of costing analysis result

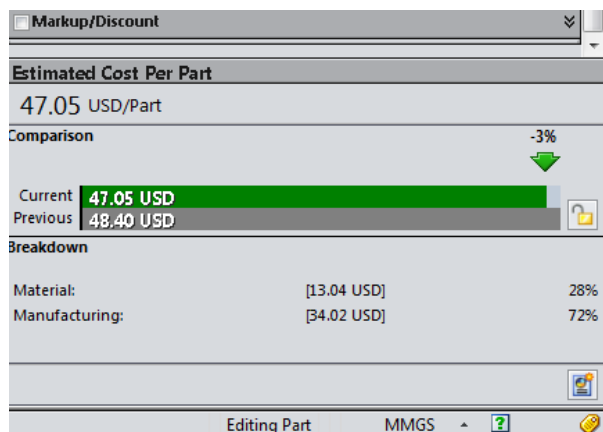


Figure 9. Decrease of cost by number of parts

Quantity – Let you specify how many parts will be manufactured.

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

Lot size - Number of parts to be manufactured in a lot.

For this example a total number of 1000 part was set, since the *end shaft* is use for a large number of guide rollers in mining equipment. In figure 9 it can be seen that cost for the whole lot has decreased by 3%.

Shop rate – Let you specify a cost per hour, regardless of what machine is used. Once you set a value it overrides all costs related to machines and labor chosen in the machining template.

Markup/Discount – let you specify a percentage factor for a discount (a negative value) or for a markup/profit (a positive value). It can be specified one of the following: *% of Total Cost* or *% of Material Cost* – that increases the cost of part based only of the material cost.

In the lower part of *Costing manager* is displayed the result of costing analysis (figure 8 and 9), respectively *Estimated Cost Per Part* - Displays the total estimated cost of the part,

which is constantly updated based on any changes made.

Comparison – One can see a bar chart for the Current and Previous costs. If any changes made to the part *decrease* the cost, the Current bar is green and the % difference ▼ is negative, and if changes made to the part *increase* the cost, the Current bar is red and the % difference ▲ is positive [6].

Breakdown - Displays the cost (value in USD) and percentage distributions for the two major contributors of the total cost:

Material - Cost of the material based on the weight and specific cost of the material used (about 28%).

Manufacturing - Total manufacturing cost, including stock preparation, machining, and any additional operations (about 72%).

As described at large in [6] and [7], there are two more icons in right-down zone:

Set Baseline icon- permits to set a baseline cost for comparison. If the design is changed later on, the cost is compared to the baseline cost.

Generate Report icon - Creates a report of the Costing data in Microsoft Word format as described in [7]. If a report is already generated, one can click Update Report icon.

3. CONCLUSIONS

As presented here step-by-step, SOLIDWORKS *Costing module* can produce a real-time feedback on costing of a part, considering material stock and quality and manufacturing (technology) modifications. Results appear in right-bottom corner of the *Costing module* Pane, which is updated dynamically with any changes made.

As a conclusion, by following the steps and the settings described in this paper, and making all the necessary changes, as presented in [8], one can perform a preliminary study of costing of a design part, and by various modifications of options to check the impact on the part cost. This can be useful to estimate part costs before effectively start the real production, and thus make various decisions that can make a specific factory more economic and competitive.

REFERENCES

- [1]. **Iancu C.**, *About SimulationExpress module features*, *Fiability & Durability Revue*, ISSN 1844-640X, 1/2015
- [2]. **Iancu C.**, *About SolidWorks sustainability module capability*, *Fiability & Durability Revue*, ISSN 1844-640X, pp.229-235,1/ 2014
- [3]. **Pawlak B.**, *SOLIDWORKS Costing an in depth Review*, June 23, 2015 *Computer Aided Technotes (CATI)*
- [4]. *SolidWorks Advanced Modules*, Dassault Systèmes SolidWorks Corporation, Waltham, MA, USA, 2012 - 2016
- [5]. **Lombard, M.**, *SolidWorks Bible*, Wiley, USA, ISBN 978-1-118-50840-4, 2013
- [6]. **Iancu C.**, *About SolidWorks costing module features*, *Fiability & Durability Revue*, ISSN 1844-640X, Supplement no.1/2016
- [7]. **Iancu C.**, *Solidworks costing analysis on a designed part*, *Fiability & Durability Revue*, ISSN 1844-640X, Supplement no.1/2016
- [8]. **Paul Tran**, *SOLIDWORKS 2020 Advanced Techniques*, SDC Publications, ISBN 978-1630573164, 2020