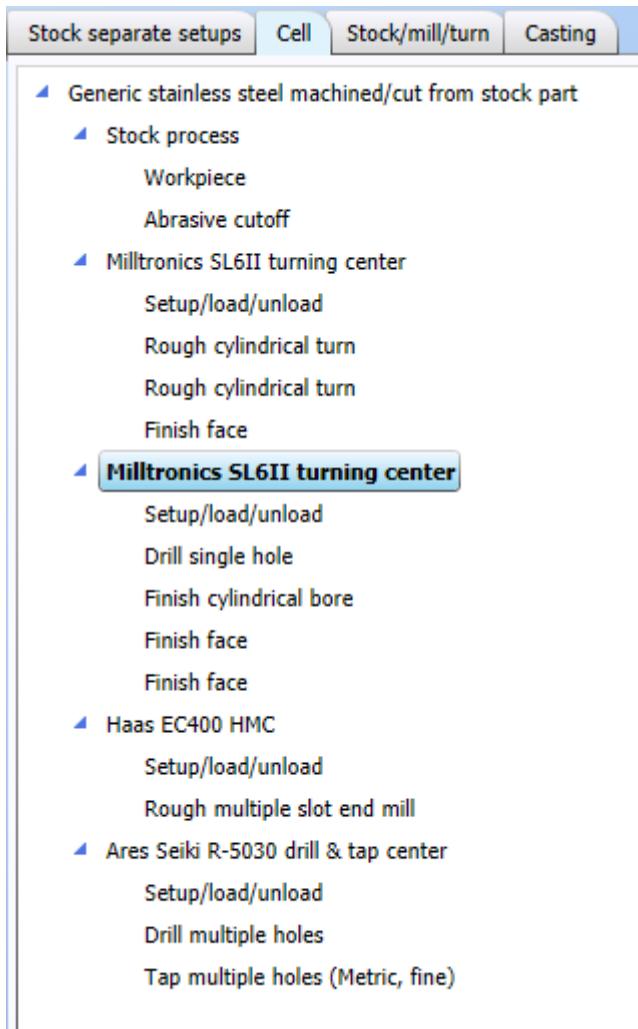


Machining Cell Analysis

A machining cell is normally a group of machines arranged so that they are physically close to one another. The parts output from the first machine in the cell feeds the parts input to the second machine in the cell, whose parts output feeds the third machine, and so on throughout the cell. Two types of machining cells are commonly used; what can be called non-dedicated and dedicated machining cells. Non dedicated machining cells are used to process families of similar parts and have the advantage that the machines within the cell are set up once to process all of the similar parts made in the cell. Non-dedicated machining cells are commonly used when groups of similar parts are made in lower production volumes. On the other hand, dedicated machining cells are used to process a single type of part. Dedicated machining cells have the advantage of decreased part handling and increased production rate and are normally used for parts made in higher production volumes.

The following tutorial demonstrates how you can compare the cost of a part machined in a dedicated machining cell with one part machined using individual machine tool setups. Normally, to make this comparison, you would first perform a normal machining analysis for your part. However, for this tutorial, we will use one of the analyses provided in the sample files.

1. Start DFM Concurrent Costing and select *Open* from the *File* menu. In the Open data file dialog choose the *machined or cast part.dfmx* file from the \data\samples folder and click the **Open** button.
2. On the Stock separate setups analysis tab, change the life volume to **100,000** and click **Calculate**.
3. Right click the *Stock separate setups* analysis tab and select *Copy*, then right-click again and select *Paste*. Rename the new tab **Cell**.
4. Click the *Milltronics SL6II turning center* entry on the Process chart and note in the response panel on the right that the cycle time per part is 701.31s. Click the *Haas EC400 HMC* entry on the Process chart and note that the cycle time per part is 269.88s. Click the *Ares Seiki R-5030 drill & tap center* and note that the cycle time per part is 119.07s. A machining cell with these machines and cycle times per part would produce a completed part every 701.31s; the cycle time for the turning center which is the bottleneck machine. This indicates a rather poorly designed machining cell because the milling machine and drilling center would be idle for much of the time. Our objective in the design of this machining cell is to balance the cycle times per part for the individual machines in the cell in order to minimize machine idle time. In this case we will consider arranging two turning centers in the machining cell to share the work of one and reduce the cycle time of the bottleneck machine.
5. Right-click the *Milltronics SL6II turning center* entry in the *Cell* analysis and select *Insert Machine Tool Setup* from the pop-up menu.
6. In the Insert machine dialog that appears, expand the *Lathes* category and double-click the *Milltronics SL6II turning center* to add that machine to the analysis. Close the Insert machine dialog.
7. Drag and drop the following operations from the first turning center to the new turning center:
Drill single hole
Finish cylindrical bore
The last two *finish face* operations



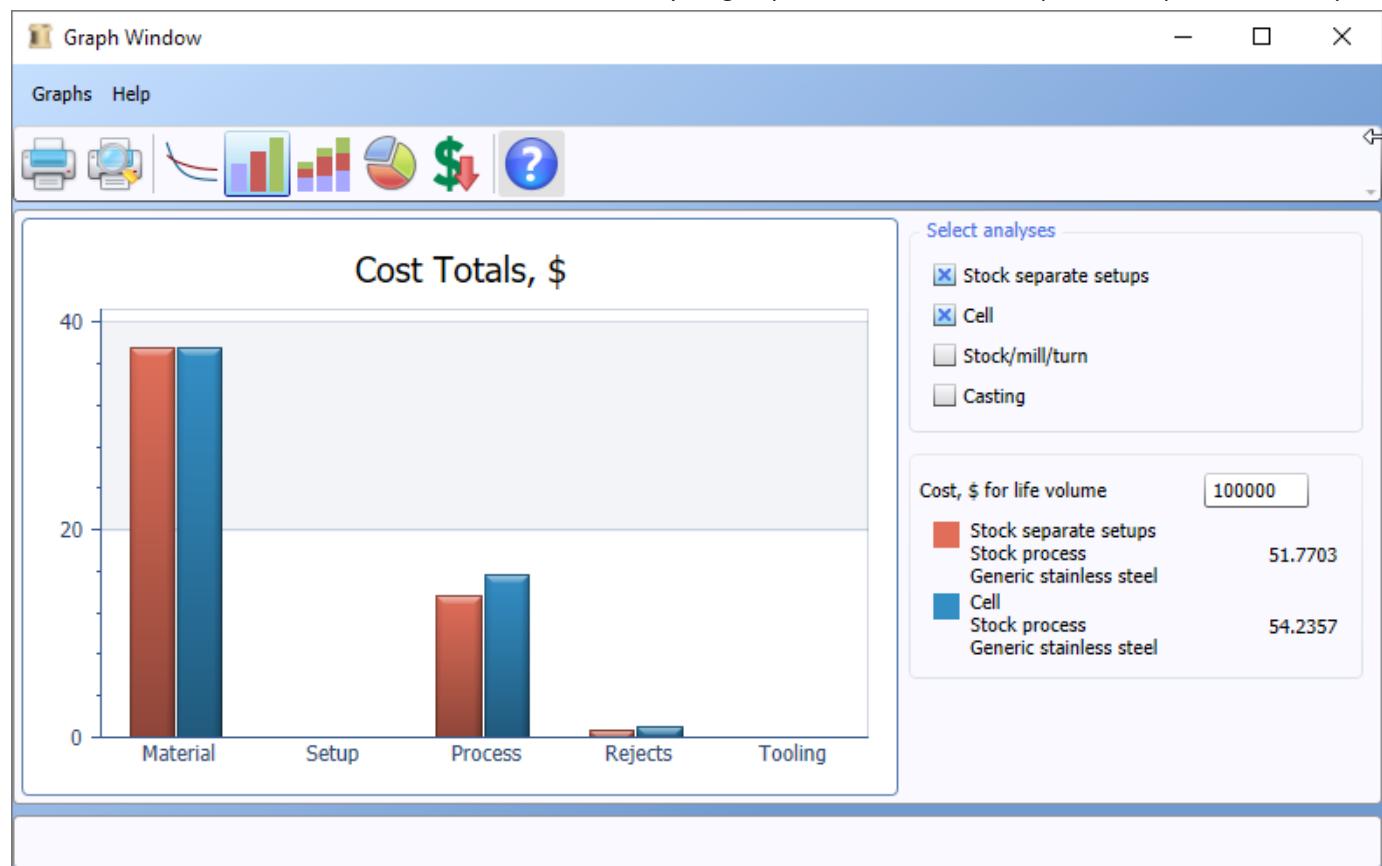
8. Click the *Setup/load/unload* operation beneath the first Milltronics SL6II turning center setup and change the number of reversals to **0**.
9. Click the *Setup/load/unload* operation beneath the second Milltronics SL6II setup and select a *3-jaw chuck* workholding device. Click **Calculate**.
10. Now note that the cycle times for the four setups are 399.99, 307.99, 269.88 and 119.07s respectively. Although this machining cell is still far from balanced, it is significantly improved from the cell that contained only one turning center.
11. Click the *Generic stainless steel machined/cut from stock* entry on the process chart and click the **Select process and material** button.
12. In the Process and Material Selection dialog, select the Machining cell process. For the material, select *Generic stainless steel* from the Stainless steel category and click **OK**.

Study the machining cell results

1. Click the *Machining cell results* entry on the Process chart and observe the results displayed in the right hand column.

Number of cell operators	<input type="text" value="1"/>
Utilization of cell operators, %	55.24
Rate for one cell operator, \$/hr	<input type="text" value="27.00"/>
Number of shifts	<input type="text" value="2"/>
Automatic transfer device rate, \$/hr	<input type="text" value="0.00"/>
Cell cycle time, s	399.99
Cell rate, \$/hr	109.80
Time to complete production, yrs	3.27

2. Note that the program has selected the longest of the four machine cycle times for the Cell cycle time. Also note that the Cell rate is the sum of the machine rates for all machines within the cell plus the rate for the number of cell operators required. The Automatic transfer device rate field allows you to simulate a cell where transfer (load/unload/reversals) between machine tools is carried out automatically – with a robot for example.
3. Click *Cost Totals* from the *Results* menu. In the *Select analyses group box*, select the *Stock separate setups* and *Cell* analyses.



4. The total cost per part for production in the cell is \$54.24 compared with \$51.77 for the part produced on separate setups. In this case, producing the part in a cell has increased its cost by 4.77%. This is primarily due to the imbalance between machines that causes the milling machine to sit idle for about 130s and the drilling center to sit idle for about 281s during the production of each part within the cell.