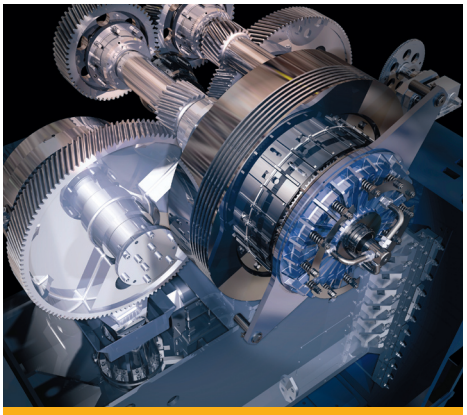
Autodesk Inventor Tips & Tricks: Creating Casting Blanks Using Derived Parts



Many products and machines make use of cast or forged parts. These parts can vary greatly in complexity and material makeup. Cast parts must undergo preparation or modification before they can be used. And, like any component of a complex design, the cast parts evolve as the design progresses.

Casting blanks are essentially the same as the finished part. Machined features are applied to the cast blank in order to create the completed part. Holes, cavities, gasket surfaces or any surface which requires a high degree of accuracy are all added as post processes to the cast or forged blank.

Create Blanks Quickly, Accurately and Easily!

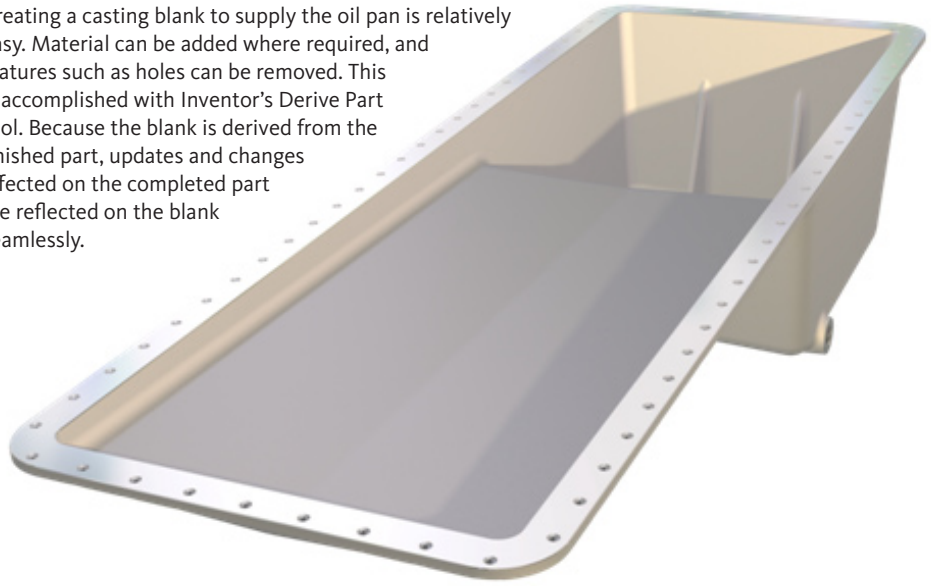
Autodesk® Inventor® provides the capability to create casting blanks that are dependent on the shape and size of the finished components. Using the Derived Part functionality within Inventor, blanks can be created that automatically update as the final parts evolve within a particular design. This ensures that the finished part can always be machined from the blank.

The Setup

Imagine that your design group is working on a large diesel engine assembly. The engine assembly is in the later stages of its design cycle, and it is time to begin work on the support equipment. It is your responsibility to create the casting blank for the cast aluminum oil pan.

The oil pan is completely designed at this point. During the finish machining process, a gasket surface is added, mount holes are drilled, and a drain port is created. In order to facilitate these machining operations, extra material is required.

Creating a casting blank to supply the oil pan is relatively easy. Material can be added where required, and features such as holes can be removed. This is accomplished with Inventor's Derive Part tool. Because the blank is derived from the finished part, updates and changes affected on the completed part are reflected on the blank seamlessly.



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Tips & Tricks

1. Let's begin by creating a new part. Derive the original oil pan as a Solid Body. Because the machined faces in the original oil pan were colored accordingly, they show up in the derived part.

> ***Tip:***
> Because the machined faces in the original oil pan were colored accordingly, they show up in the derived part. This can serve as a reminder as to which faces or features need extra material in the blank.

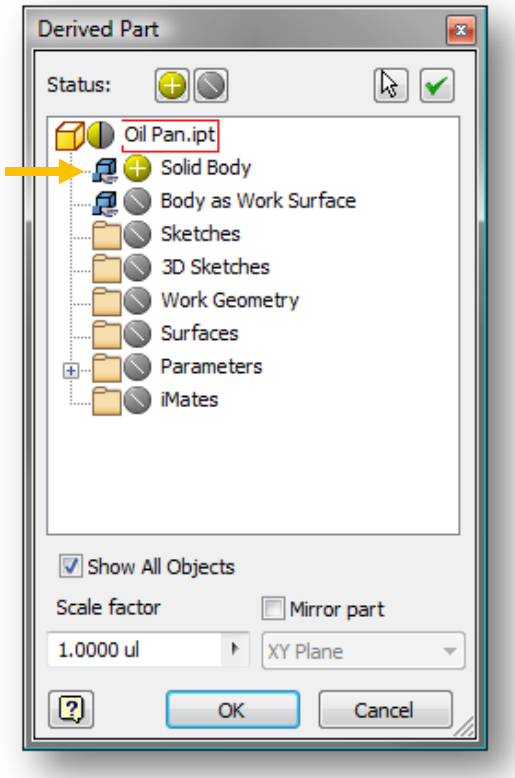

Figure 1, Derive Tool.

2. The next step is to begin removing machined features. This can be done using any of the Inventor features or tools at your disposal. In this case, we will remove the Drain port first. We will do this with the Delete Face tool . With the Heal option enabled we select the three faces from the port.

> ***Tip:***
> Using the Heal option causes Inventor to delete the selected surfaces and heal the void using surrounding geometry.

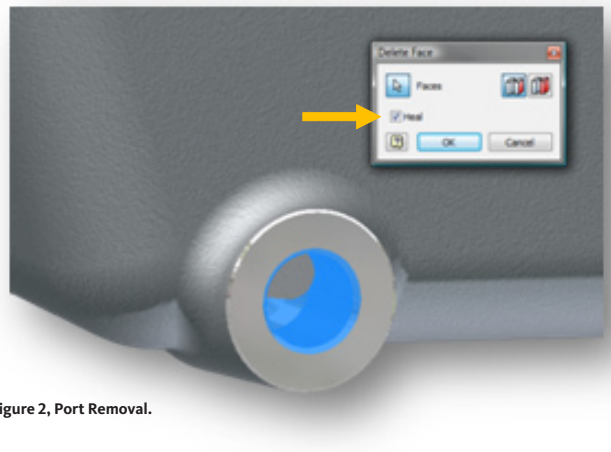

Figure 2, Port Removal.

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3. With the port removed, we can continue to remove features. We need to add material to the outer seal face for machining allowance. Before we do this, create a parameter called Allowance, and assign a value of .1 in.

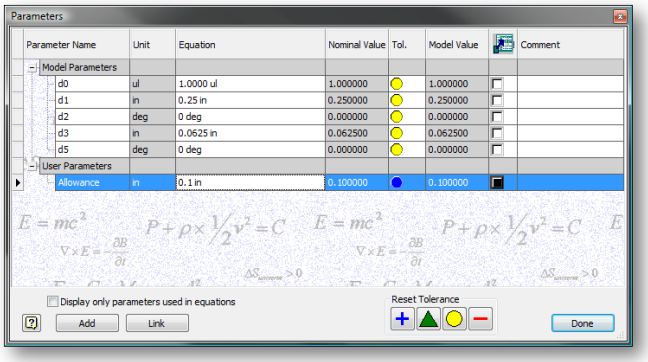

Figure 3, Allowance Parameter.

> ***Tip:***
> Using the Allowance parameter makes it very easy to change the machining allowance should it be necessary in the future.

4. Next, create a Work Plane that is offset from the port seal face, using the Allowance parameter we created earlier.

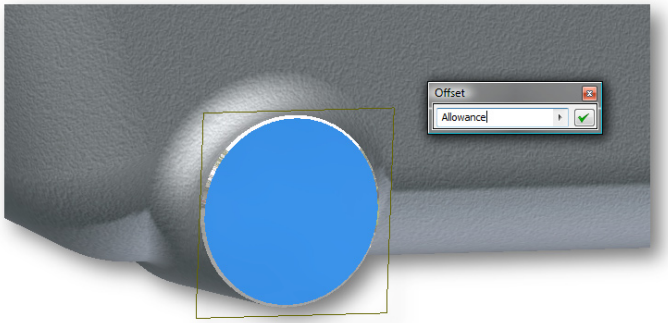

Figure 4, Offset Work Plane.

5. To add material to the Drain seal face, we will use an extrusion feature. We begin by creating a sketch on the Work Plane that was created earlier. Project the cast edge to define the outer boundary of the material.

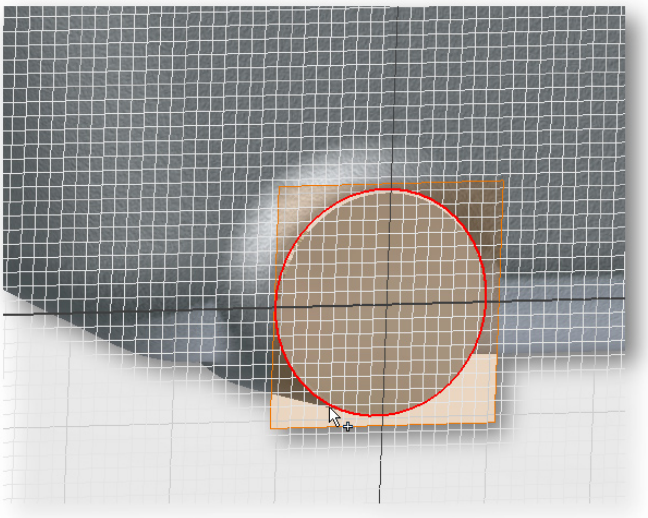

Figure 5, Sketch Creation.

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6. Add the extra material by extruding the sketch to the outer side face of the pan.

> ***Tip:***
> Using a "To Extrusion" ensures that the extrusion will add enough material – even if the Allowance is increased.

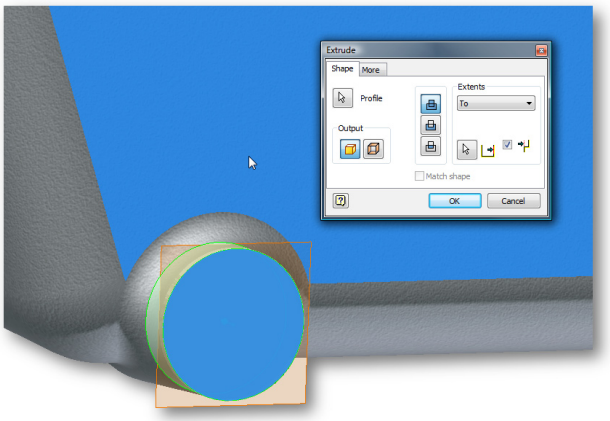


Figure 6, Circular Extrusion.

7. Next, we will remove the mounting holes and add material to the gasket surface with a single extrusion. Begin by creating a Work Plane offset from the gasket surface. Again, use the Allowance parameter.

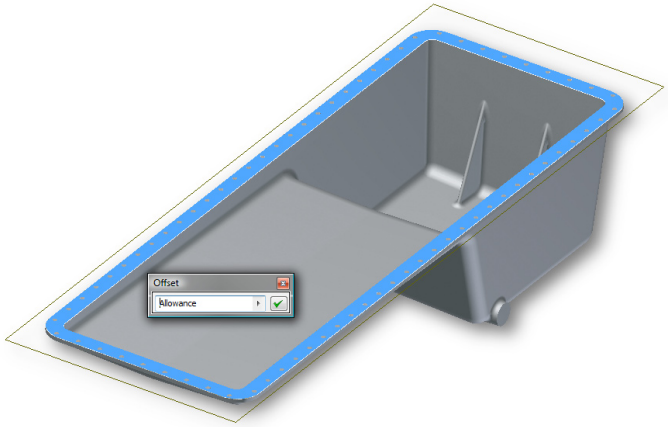


Figure 7, Offset Work Plane.

8. Create a sketch on the new plane. Project the inner edge and the outer edge of the flange to the sketch.

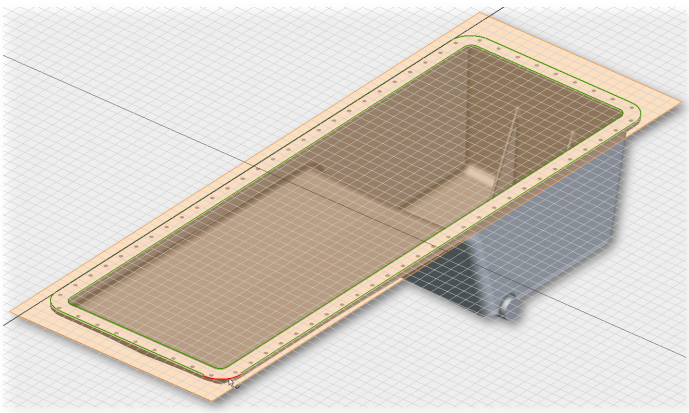


Figure 8, Sketch Creation.

9. Extrude the new profile to the opposite face of the oil pan flange. Again, use the To option while extruding.

Figure 9, Flange Extrusion.

10. This just leaves the small counterbores on the lower face of the flange. To remove these, we will use the Delete Face tool. With the Heal option on, select all of the faces associated with the counterbores.

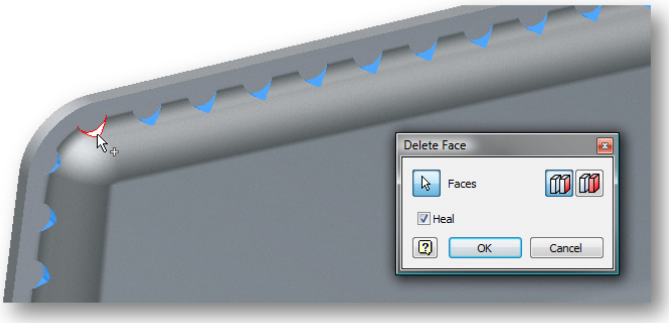


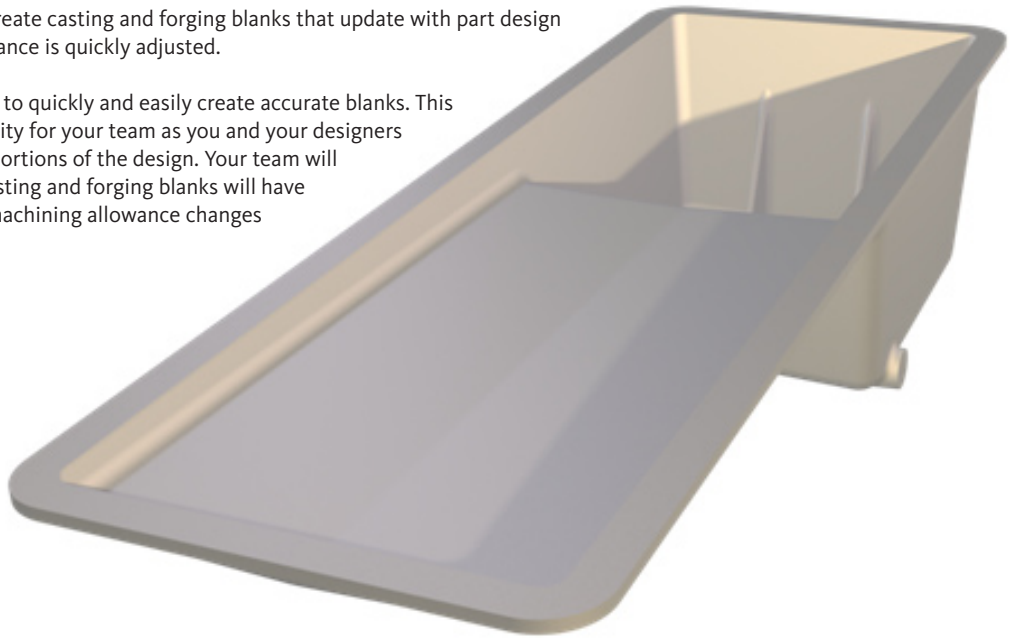
Figure 10, Remove Counterbores.

11. The blank is now complete. If it is determined that more or less material is required, it is just a matter of changing the Allowance parameter to reflect the new values. If the design of the Oil Pan changes dimensionally, the blank will update to reflect that change.

Conclusion

Using this workflow, it is very easy to create casting and forging blanks that update with part design and material changes. Machining allowance is quickly adjusted.

Leveraging this method will permit you to quickly and easily create accurate blanks. This ability will result in increased productivity for your team as you and your designers spend less time working on the fringe portions of the design. Your team will also experience fewer errors as your casting and forging blanks will have the ability to absorb dimensional and machining allowance changes effortlessly.



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