Suggested Technique for Redefining Imported Surfaces

The following describes the recommended procedure for redefining imported surface geometry in Pro/ENGINEER Release 16.0 or later. It assumes that the IGES file has already been created and imported into Pro/ENGINEER.

Procedure

1. The goal of this process is to obtain the completed surface quilt shown in Figures 1 and 2 from the imported IGES data shown in Figure 3.

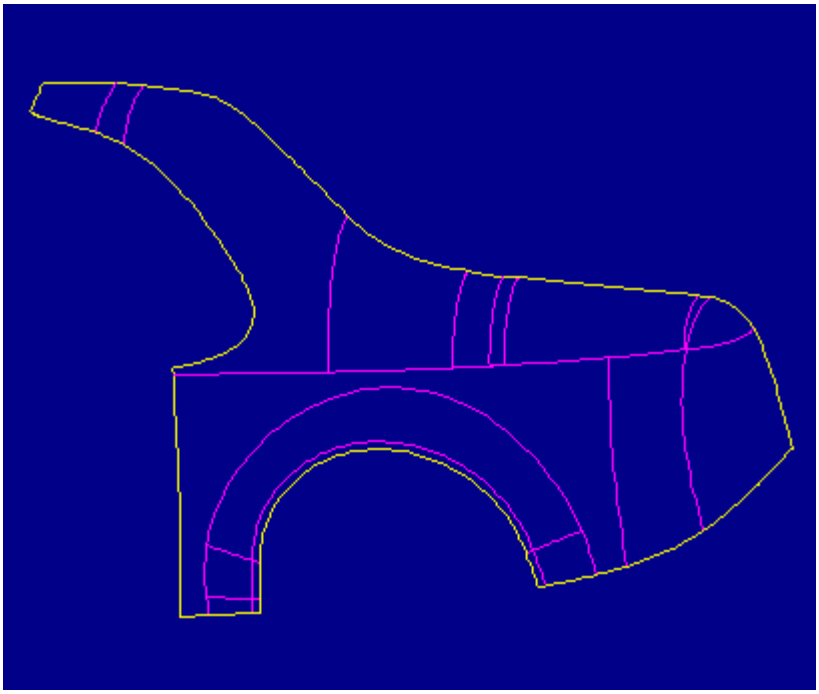

Figure 1

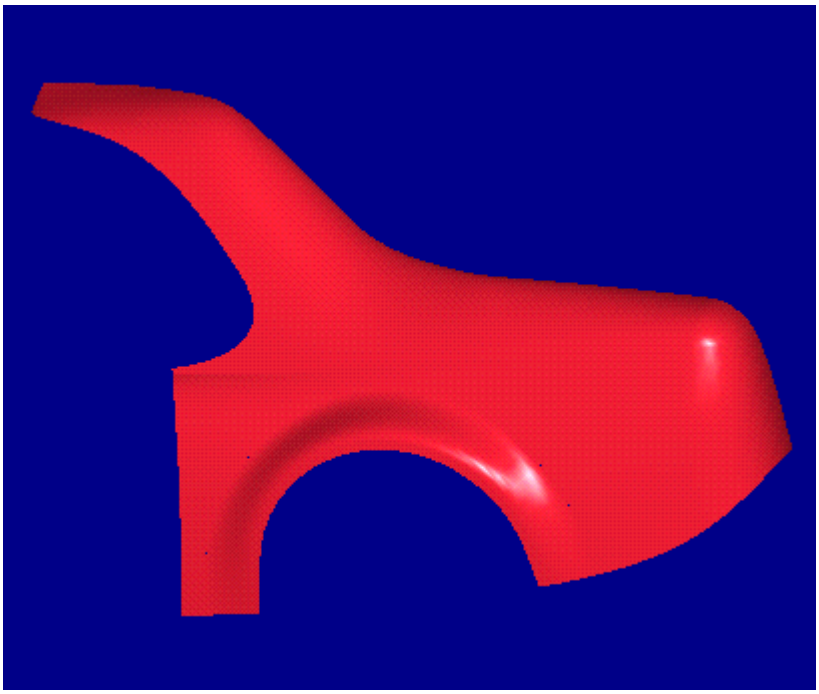

Figure 2

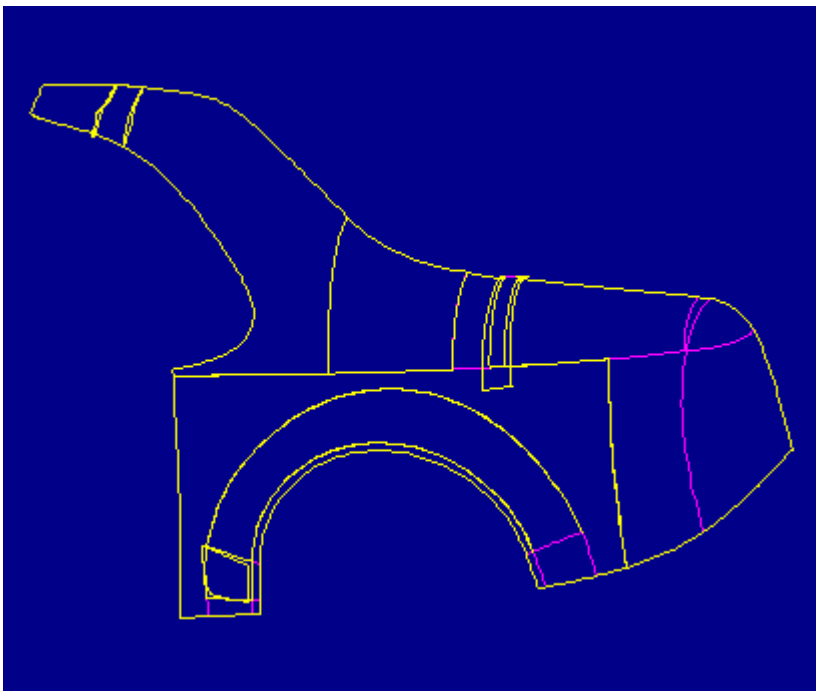

Figure 3

2. In the PART menu select **Feature**, **Redefine**, and the import feature. In the REDEF IMPT menu select **Heal Geometry, Manual**, **Zip Gaps**, **Auto Select** to select th edge chains highlighted in blue in Figure 4.

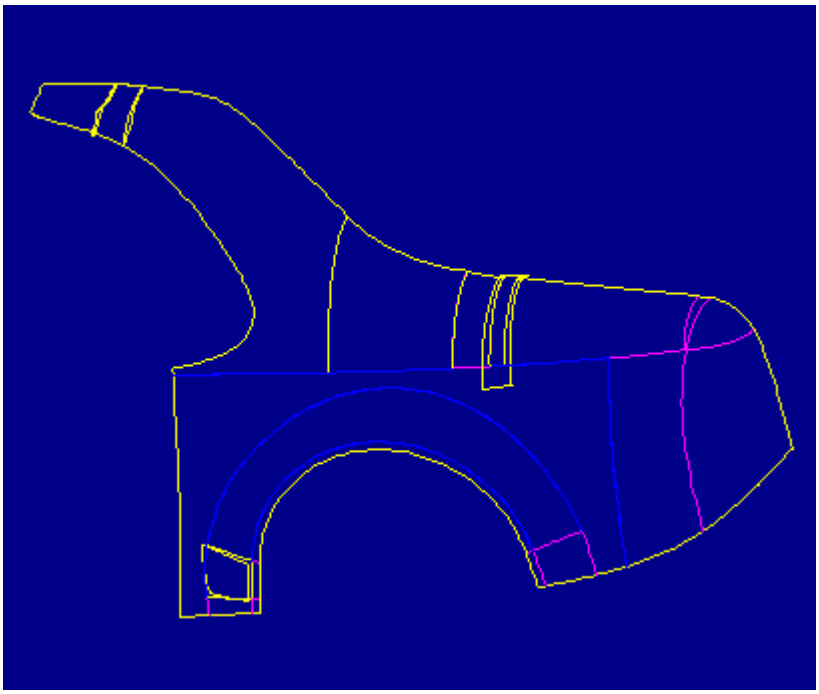

Figure 4

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3. In the SEL CHAINS menu select **Zip Gaps** to view the proposed changes necessary to join the selected edges. The red mesh lines are present to allow better visualization of the surfaces.

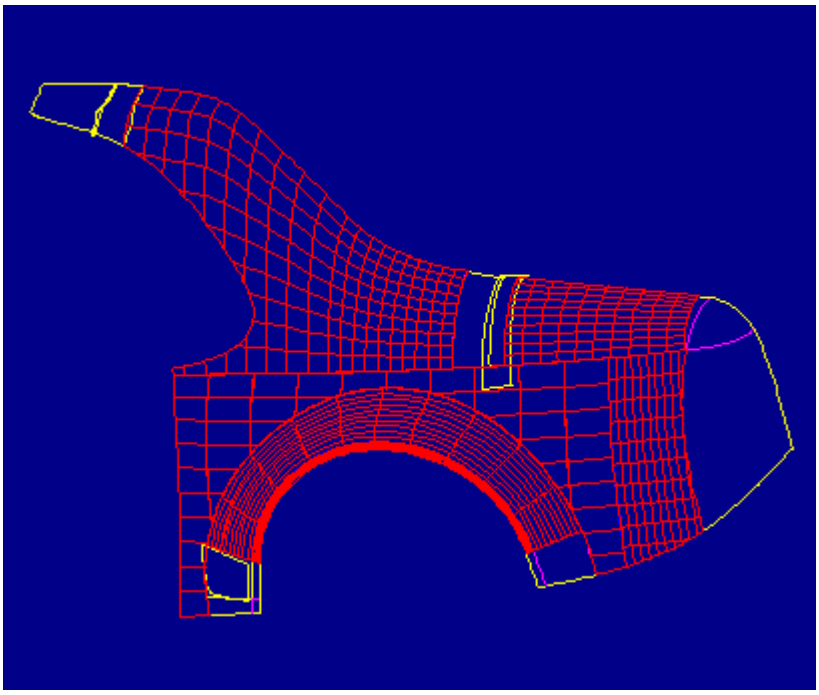

Figure 5

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4. In the ACCEPT FIX menu select **Accept** to finish zipping the selected gaps.

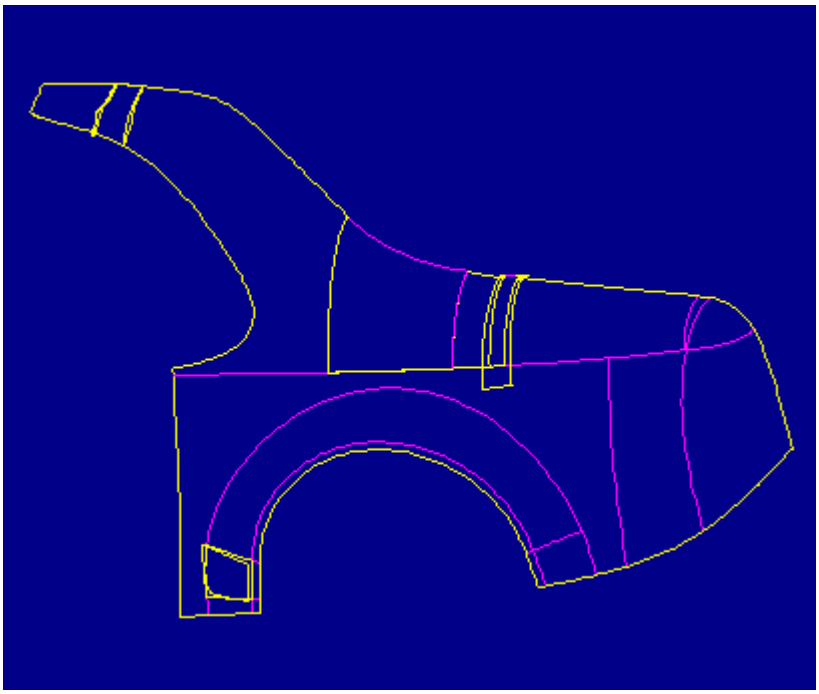

Figure 6

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5. The Message Window presents the following information: "WARNING: Design intent is unclear. Use "Geom Check" menu for details." In the SEL CHAINS menu sel **Geom Check**. Figure 7 shows a surface highlighted in red and an edge of that surface highlighted in cyan. In the SHOW ERRORS menu select **Item Info**. The Information Window appears with the following message: "The two highlighted surfaces are coincident for all or a portion of their geometry, including the highlighted edge. You will probably want to delete one coincident surface to avoid creating a zero volume region when surfaces are joined." What you see is not one surface highlighted in red. There are actually two surfaces right on top of each other highlighted in red, and the edge highlighted in cyan is one area of the two surfaces that coincident.

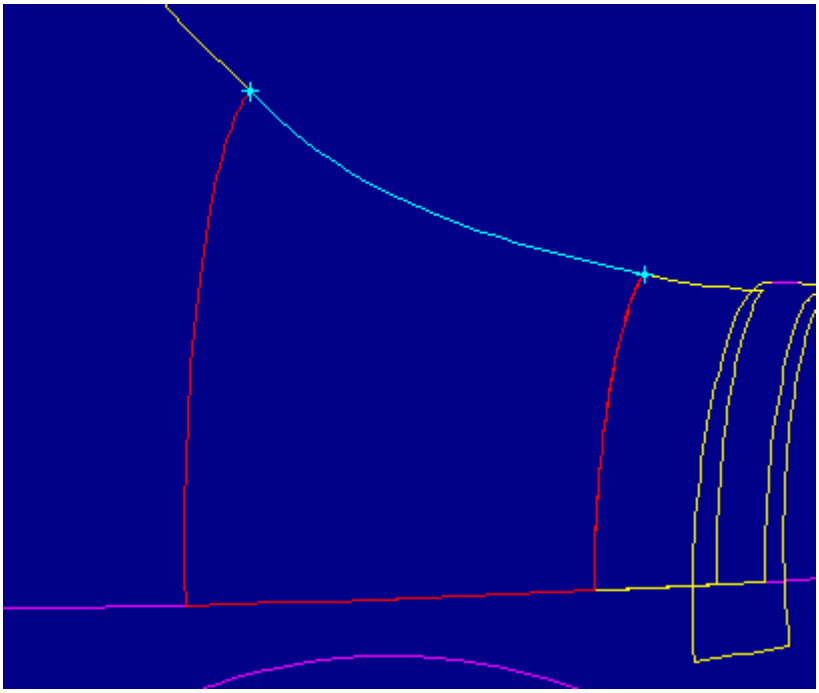

Figure 7

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6. In the HEAL GEOMETRY menu select **EXCLUDE SURFS** and one of the two coincident surfaces. In the EXCLUDE SRFS menu select **Done**. Figure 8 shows the import feature after regeneration. Notice that one of the two coincident surfaces is entirely outlined in yellow, i.e. it has been excluded from joining into the quilt.

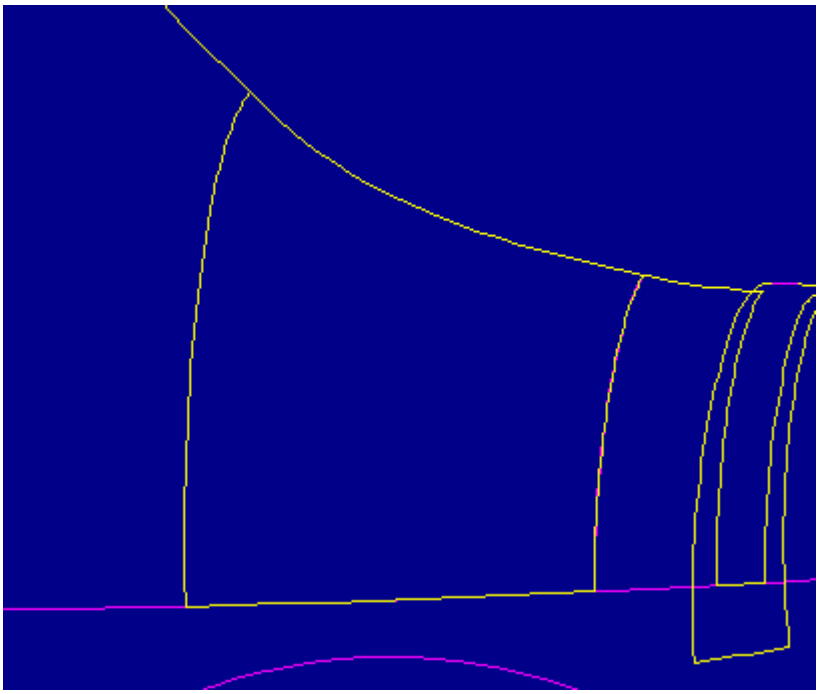

Figure 8

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7. In the VIEW menu select **Layer.** Select **New** from the LAYER Pull-Down Menu, Enter a layer name in the NEW LAYER window. Click on the layer just created and click **Add** from the ITEM menu, and use the **Quilt** option to add the excluded surface to a layer that is blanked. Figure 9 shows the current status of the import featur Notice that there are still three areas that need to be addressed.

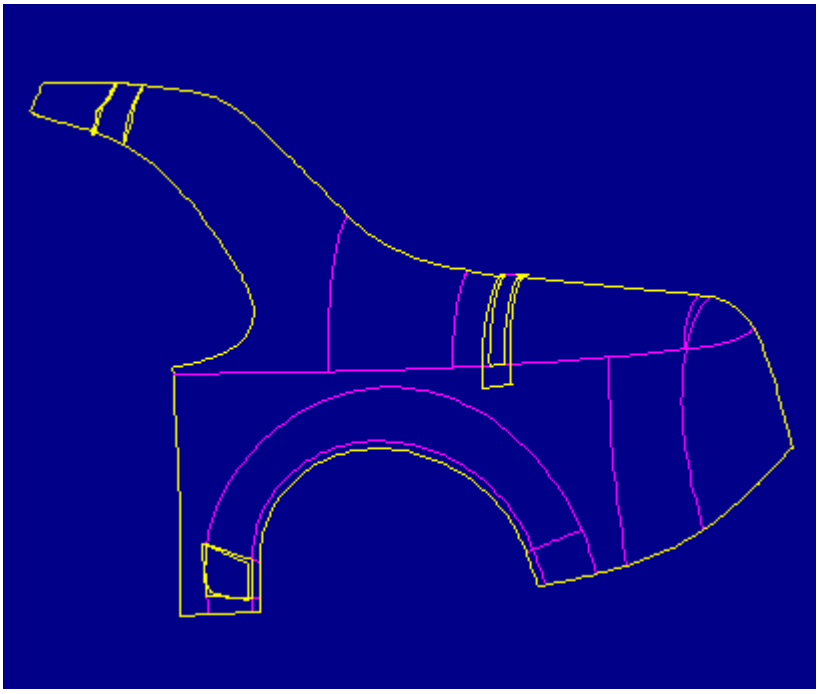

Figure 9

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8. Figure 10 shows an untrimmed surface that is currently too large to join into the quilt.

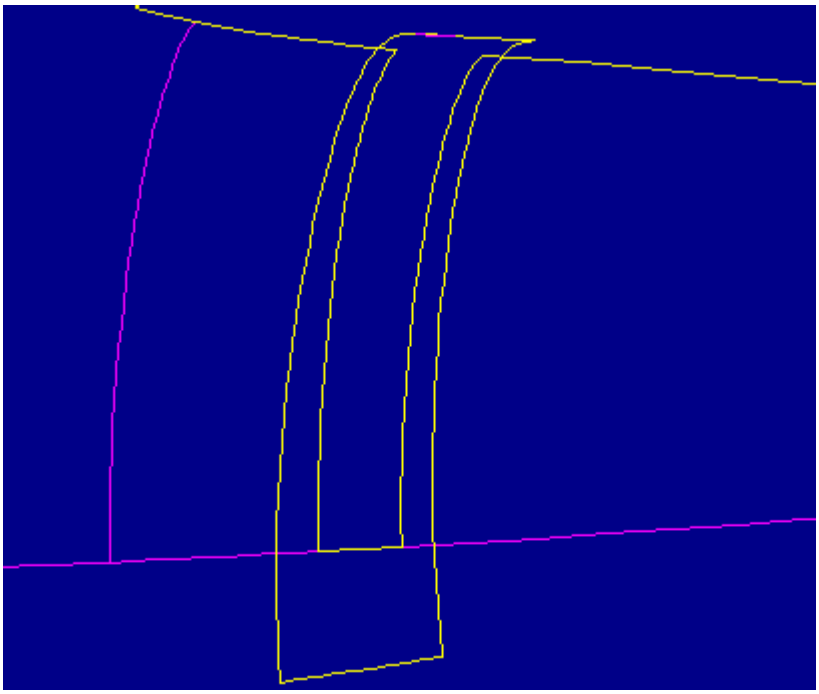

Figure 10

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9. In the HEAL GEOMETRY menu select **Manual, Edit Bndry**, and the untrimmed surface. In the SELECT CONT menu select **Sel Contour**. In the CHAIN OPT menu select **Select All** . Figure 11 shows the entire contour of the untrimmed surface ready to be edited.

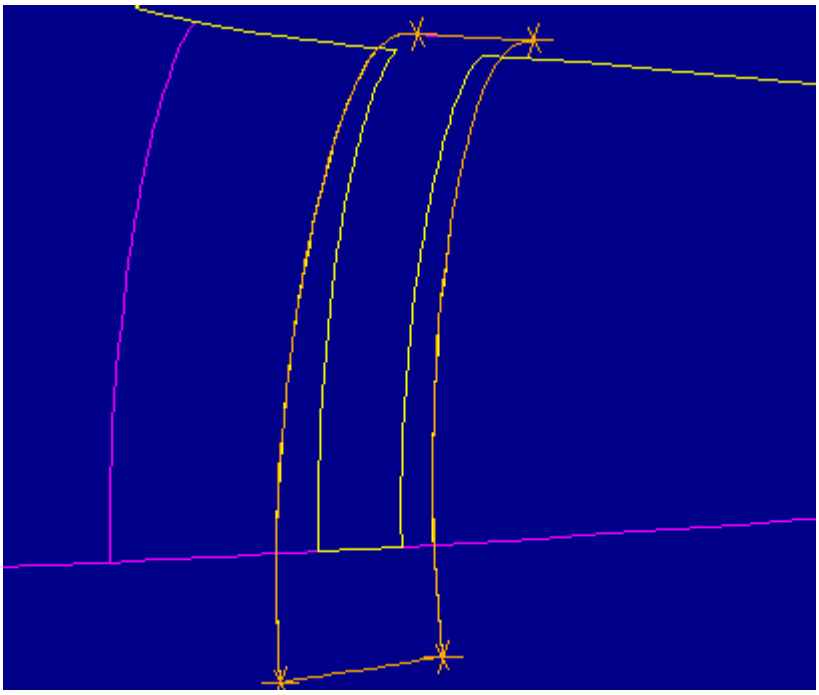

Figure 11

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10. In the EDIT BNDRY menu select **Create**, **Project**. Figure 13 shows three edges highlighted in blue that will be projected onto the untrimmed surface.

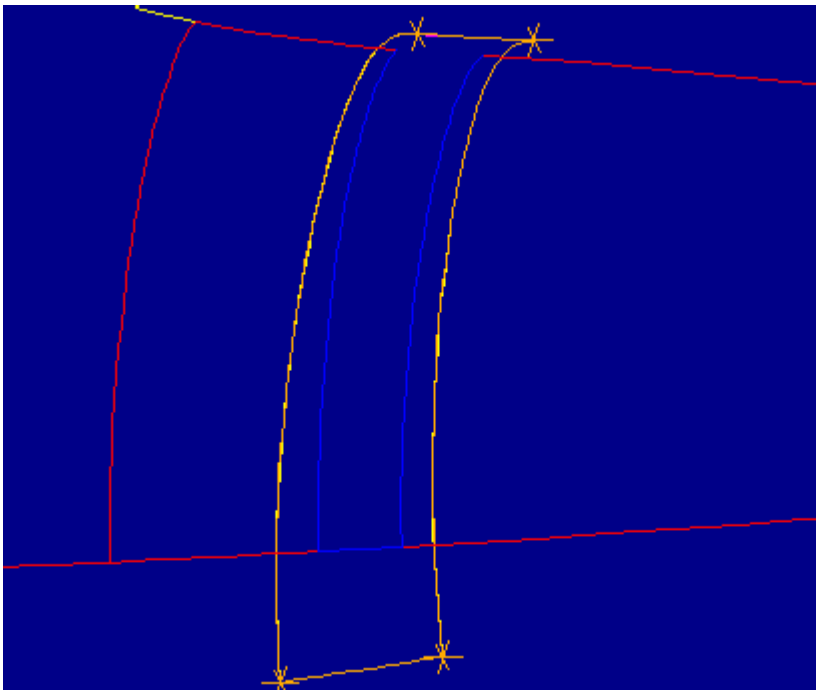

Figure 12

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11. In the GET SELECT menu select **Done Sel** to create the inner chain of orange edges shown in Figure 13.

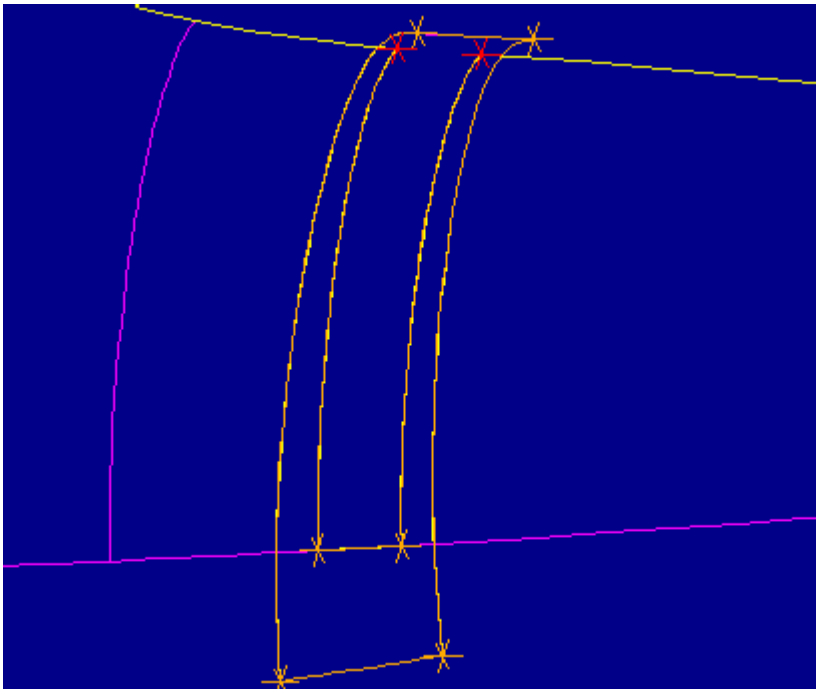

Figure 13

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12. In the EDIT BNDRY menu select **Delete**. Select the four segments belonging to the outer loop of orange edges. Figure 14 shows the results. Notice that the original yellow contour of the untrimmed surface is still present. This is the case until the replacement of the original contour with the new orange contour is completed successfully.

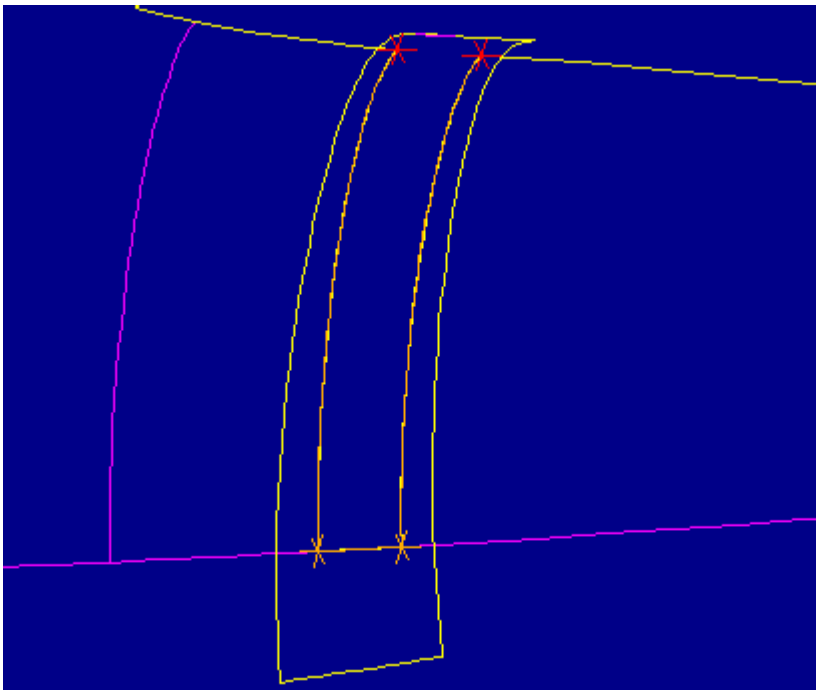

Figure 14

13. In the EDIT BNDRY menu select **Create**, **Connect**. Select the two red vertices at the ends of the orange chain. In the GET SELECT menu select **Done Sel**. Figure 1 shows the orange loop that has just been completed by the addition of the top segment. Notice that the red vertices in Figure 14 are now orange. The ends of chains are indicated by red crosses and internal vertices are indicated by orange crosses.

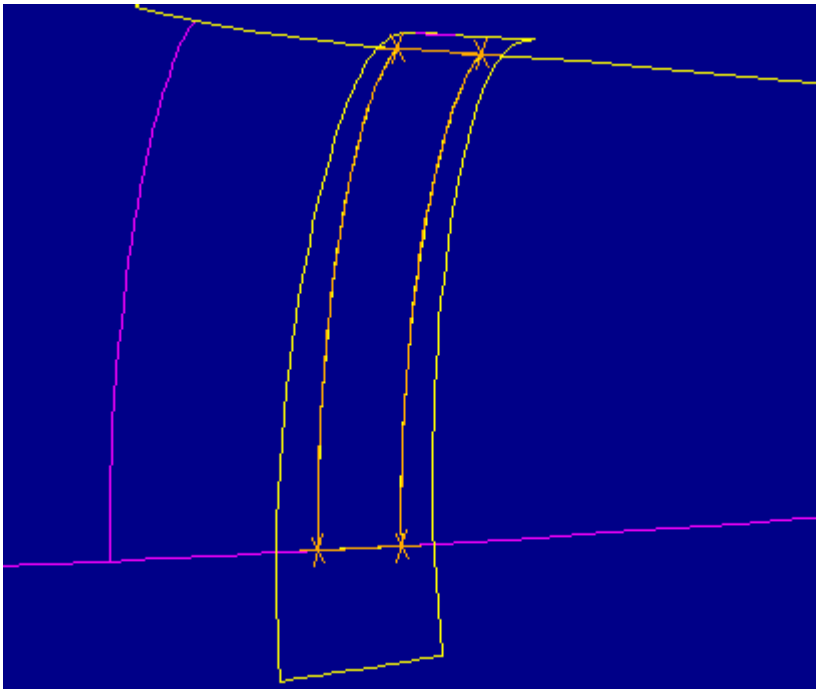

Figure 15

14. Figure 16 shows the replacement contour highlighted in red upon selecting **Preview**. This indicates that the current contour can be used to replace the original conto Figure 17 shows the replacement of the original contour upon selecting **Done**. Notice how the surface has been trimmed so it fits properly into the quilt. Also note tha the surface has not been joined into the quilt because we have not yet returned from the editing process and allowed the regeneration of the import feature.

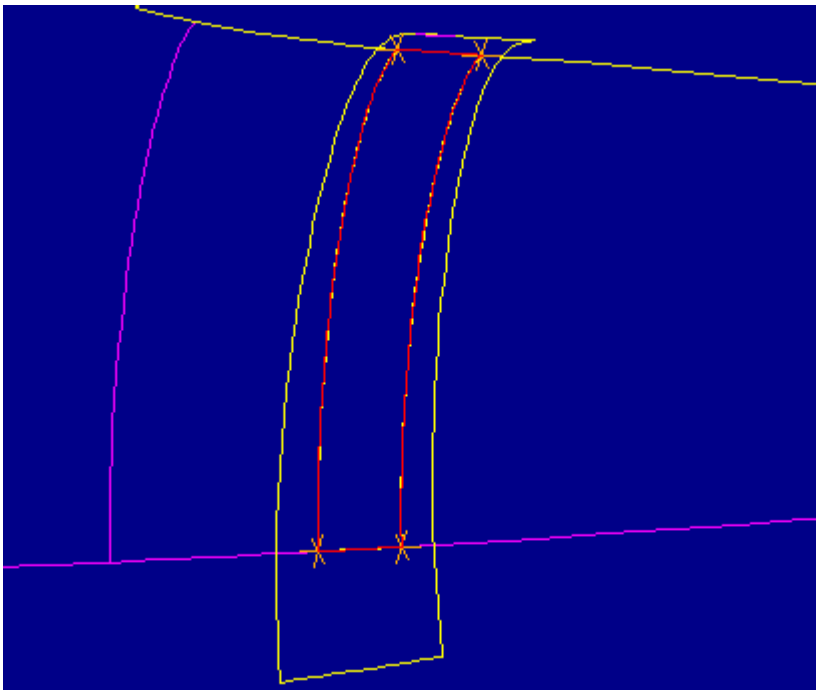

Figure 16

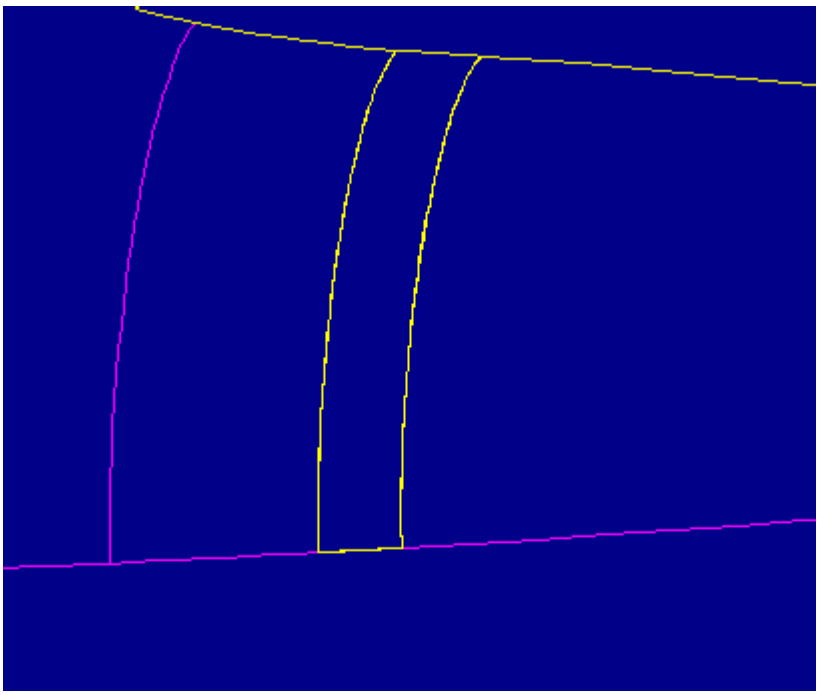

Figure 17

15. Figure 18 shows the current status of the import feature. The next area to be addressed is shown in Figure 19. The red mesh lines on the surface are isolines. Isolin represent the two main directions of surface creation. A surface can be meshed by selecting from VIEW menu **Advanced, Mesh Surface**. Notice that the yellow edg belonging to the surrounding surfaces are very similar to the red isolines. Edge and vertex misalignment is common to imported surfaces. It is frequently the case tha surfaces were trimmed along isolines, more surfaces would join together automatically.

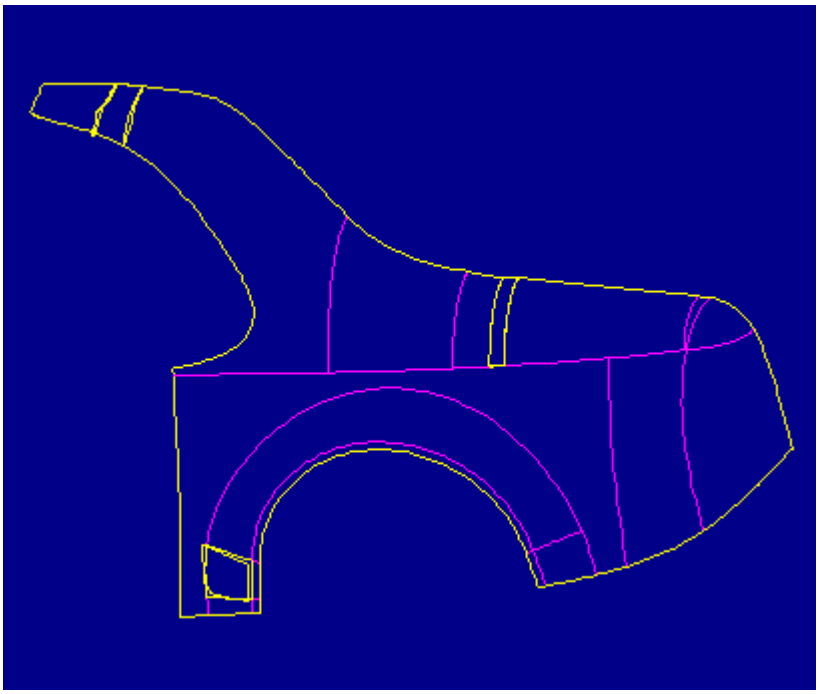

Figure 18

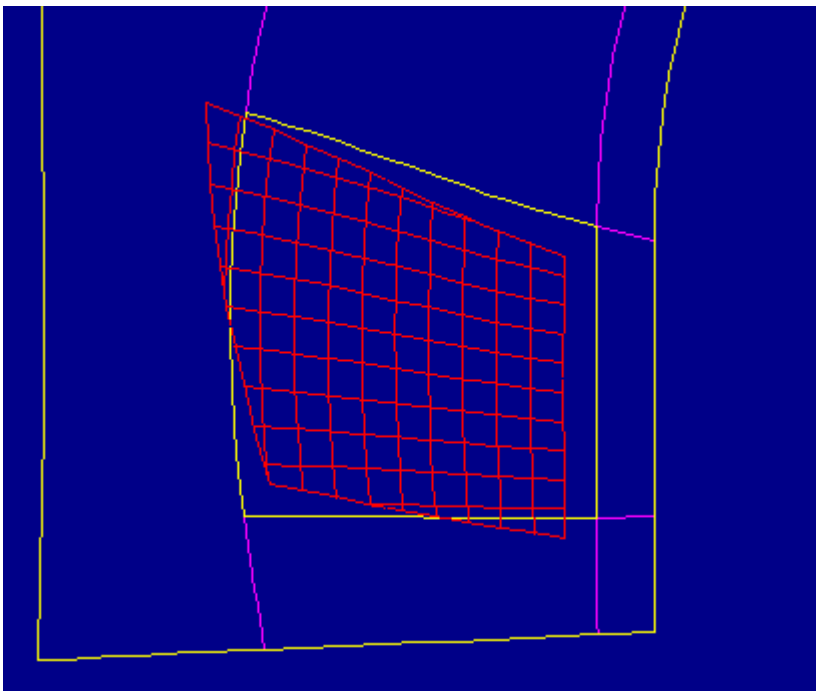

Figure 19

16. In the SELECT SURF menu select **Sel Surface** and the meshed surface. In the SELECT CONT menu select **Sel Contour**. In the CHAIN OPT menu select **Select A** Figure 20 shows the original contour ready to be edited.

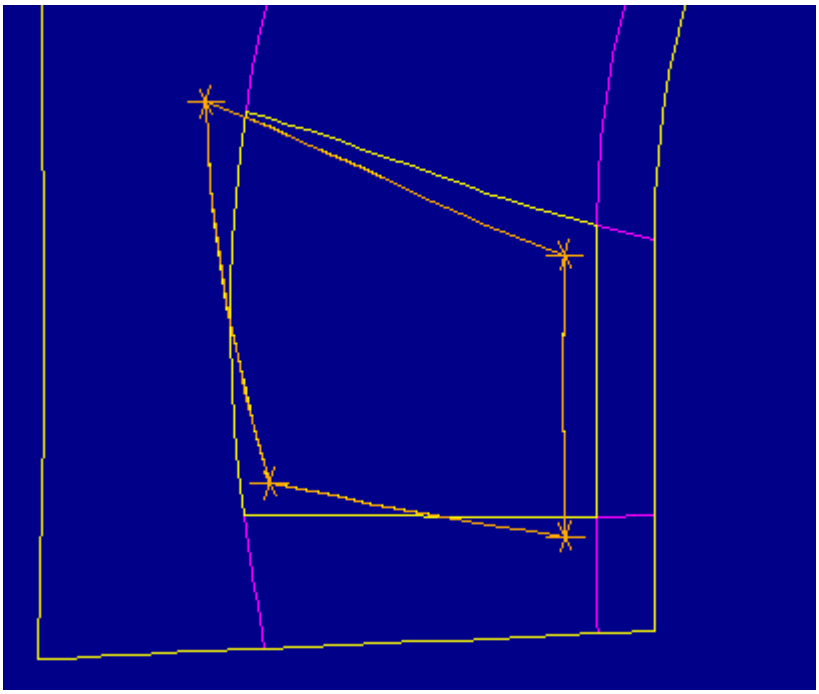

Figure 20

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17. In the EDIT BNDRY menu select **Modify**, **Move Vertex**. Select the upper left orange vertex and use **Query Sel** to place it at the upper left "end of edge". Figure 21 shows the resulting contour. Figures 22-24 show the contour after moving the lower left, lower right, and upper right vertices in the same manner.

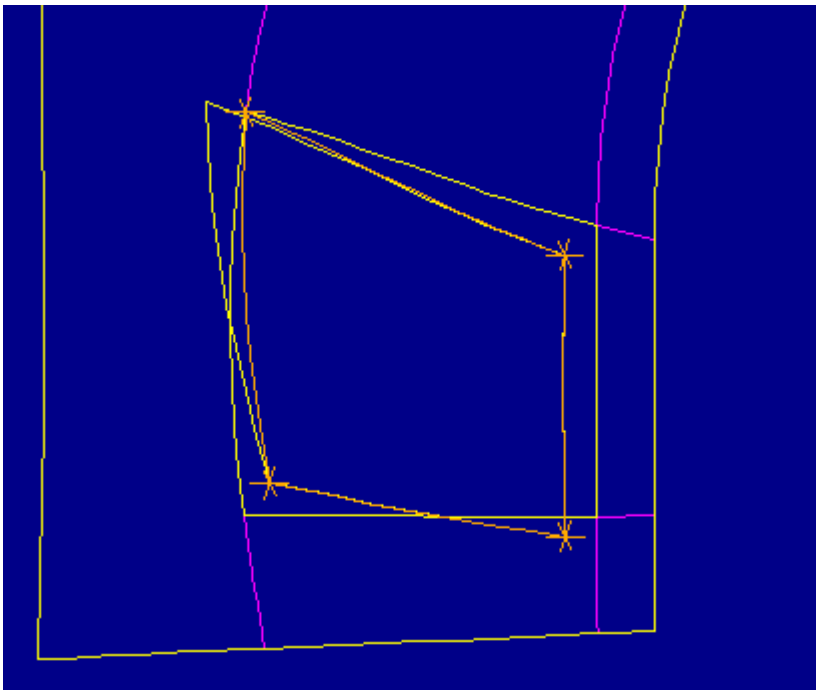

Figure 21

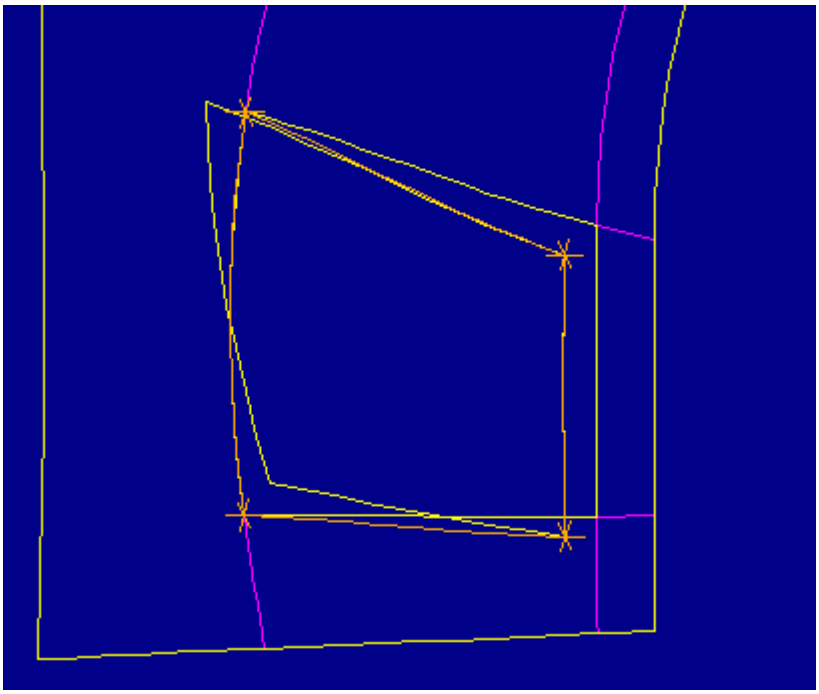

Figure 22

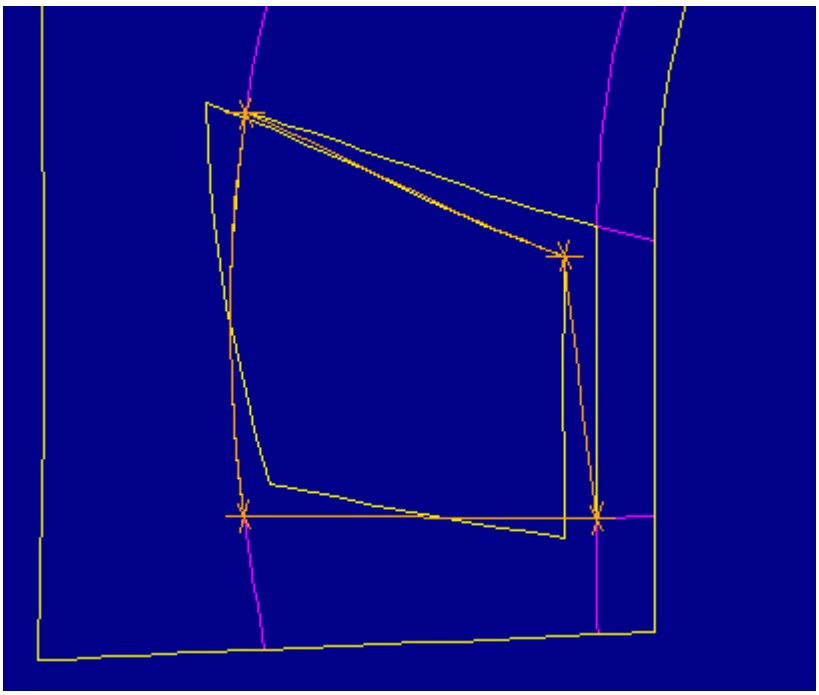

Figure 23

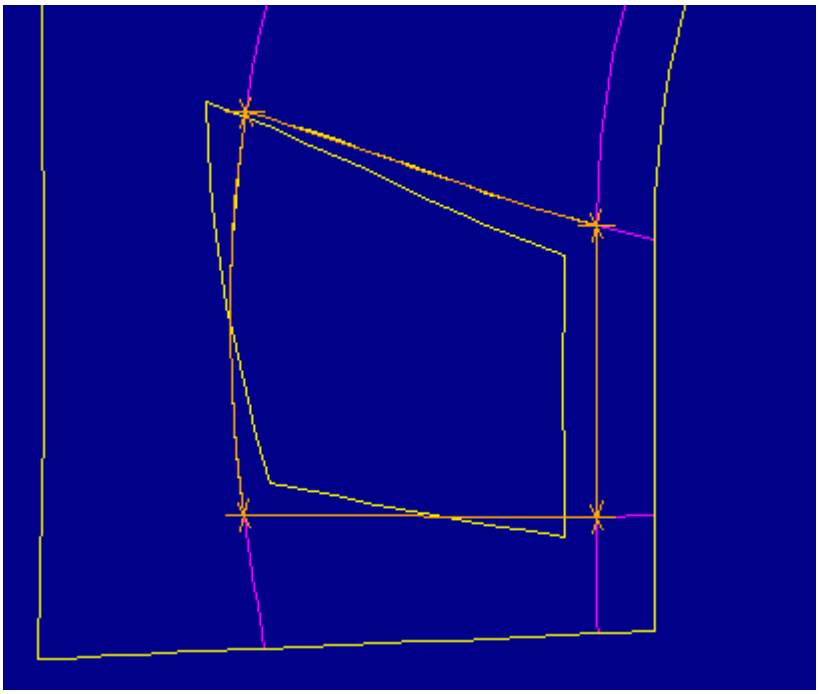

Figure 24

18. Figure 25 shows the replacement contour highlighted in red upon selecting **Preview**. Figure 26 shows the replacement of the original contour upon selecting **Done**. Notice how the edges and vertices have been aligned so the surface fits properly into the quilt. Also note that the surface has not been joined into the quilt because have not yet returned from the editing process and allowed the regeneration of the import feature.

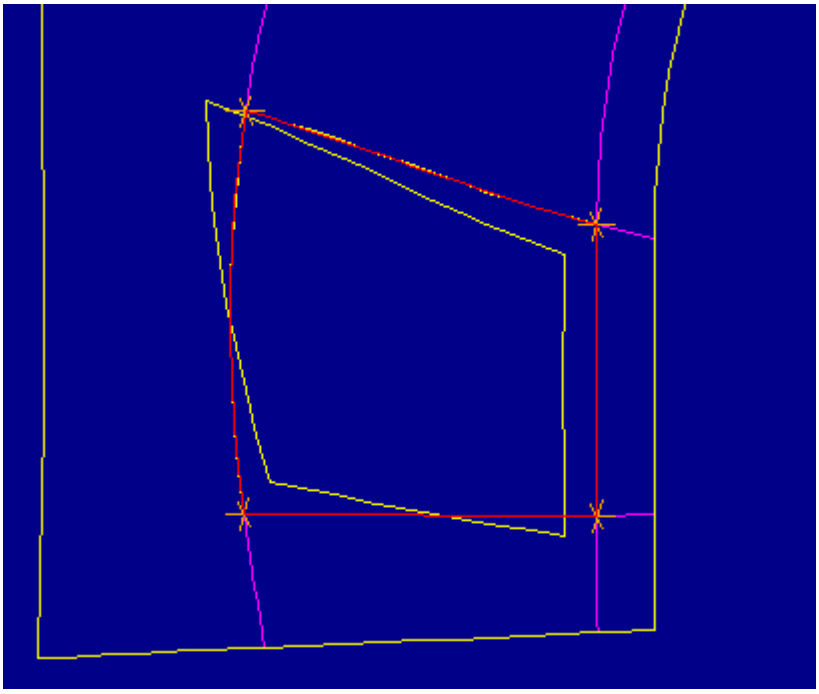

Figure 25

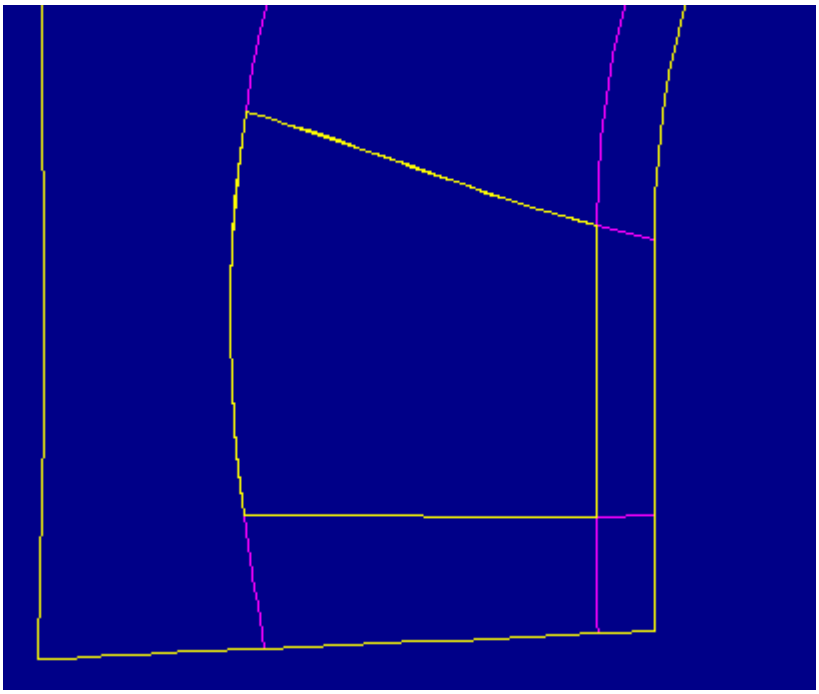

Figure 26

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19. Figure 27 shows the current status of the import feature. The next area to be addressed is shown in Figure 28. Notice that the yellow edges belonging to the adjacer surfaces are very similar to the red isolines.

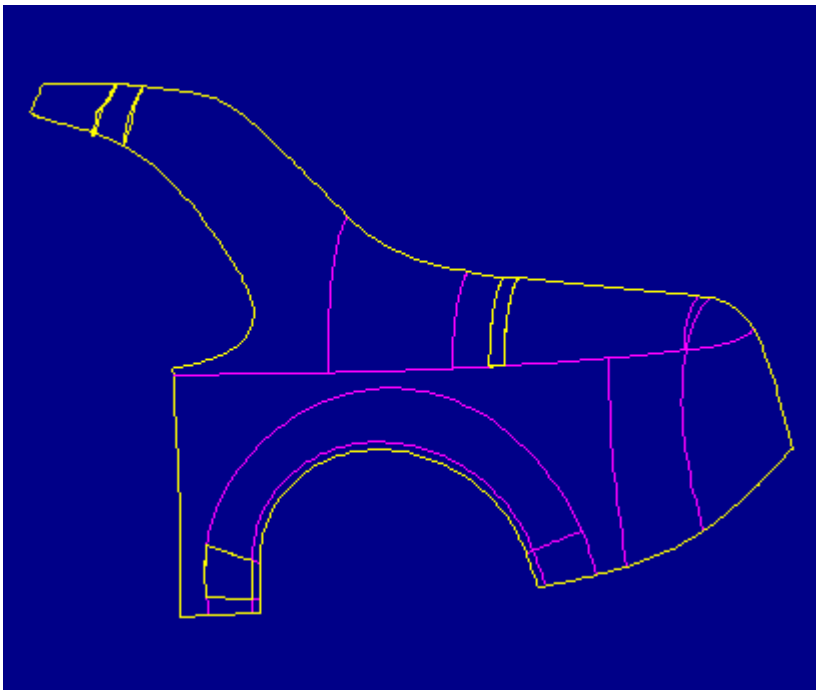

Figure 27

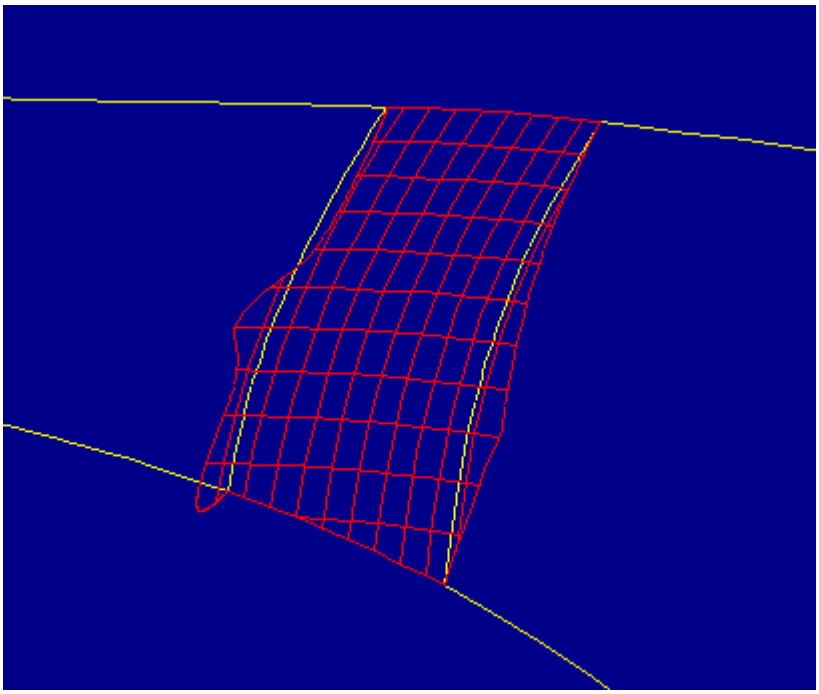

Figure 28

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20. In the SELECT SURF menu select **Sel Surface** and the meshed surface. In the SELECT CONT menu select **Sel Contour**. In the CHAIN OPT menu select **Select** Figure 29 shows the original contour ready to be edited. Notice the extra vertices in the top, right, and bottom edges and the poor quality of the left edge. Edge fragmentation is common to imported data and can lead to extra, unnecessary surface patches when the edges are referenced in sweeps or blends.

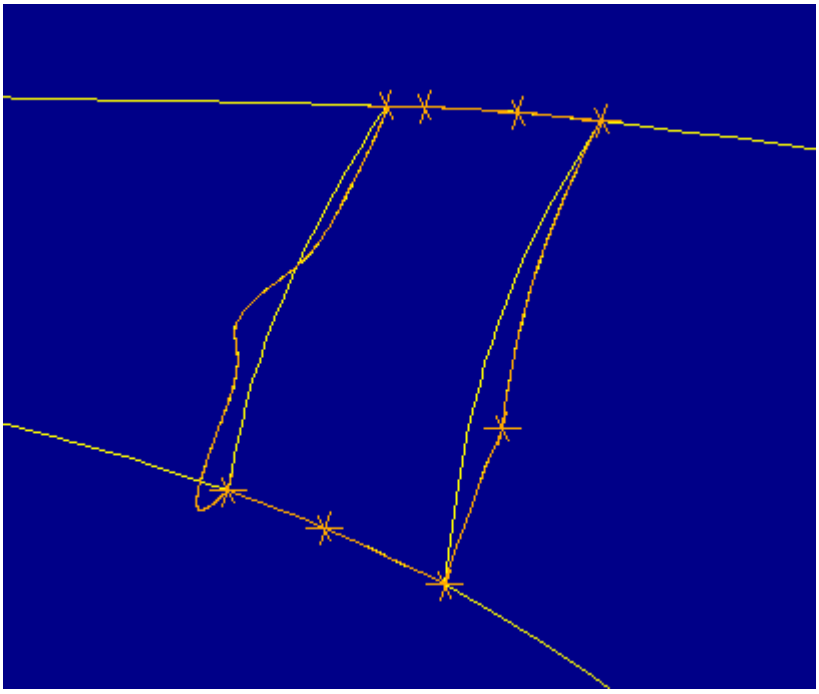

Figure 29

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21. In the EDIT BNDRY menu select **Modify**, **Merge Edges**. Select the two orange vertices at either end of the bottom edge and in the CHOOSE menu **Accept** the cha highlighted in red in Figure 30. Figure 31 shows the resulting edge.

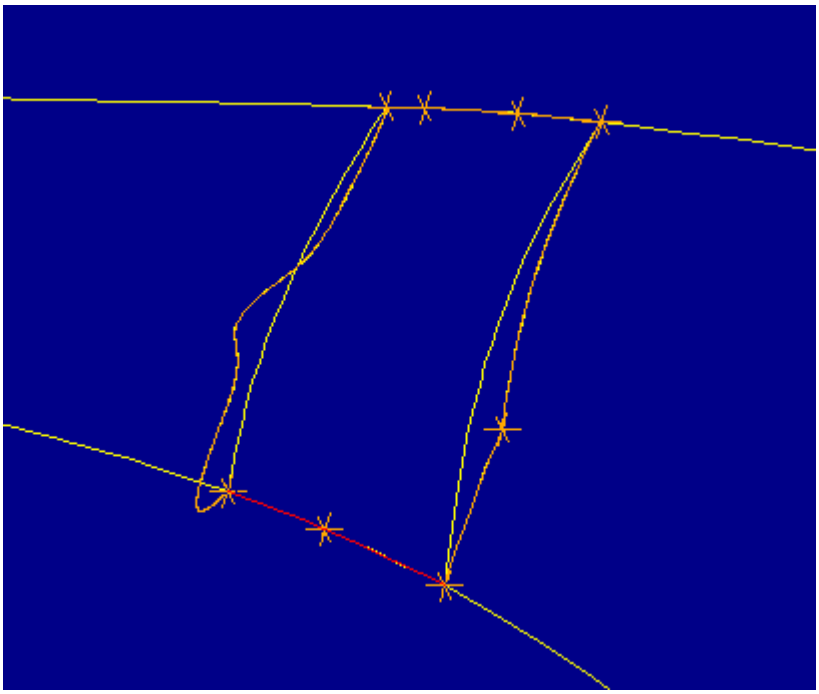

Figure 30

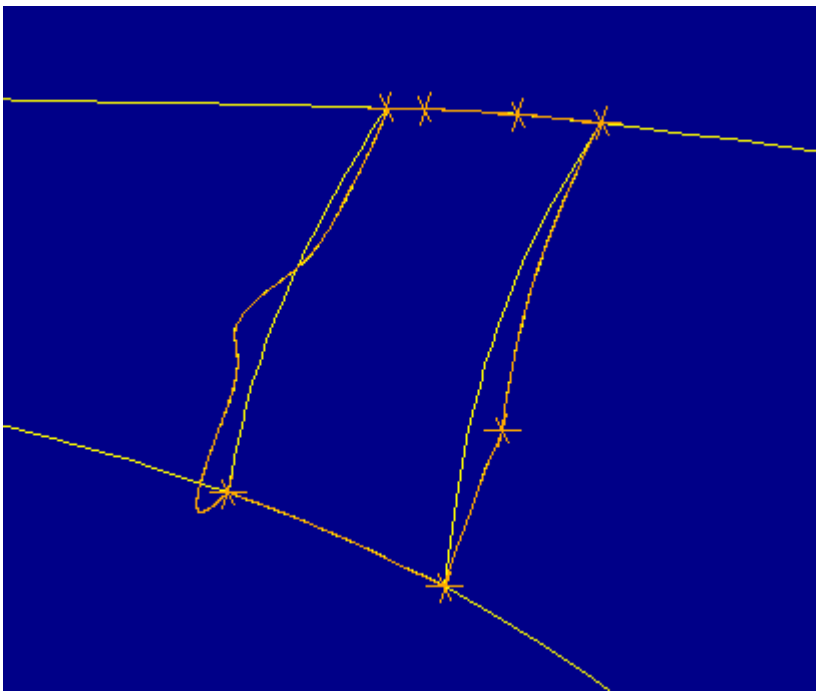

Figure 31

22. In the MODIFY EDGS menu select **Merge Edges**. Select the two orange vertices at either end of the top edge and in the CHOOSE menu **Accept** the chain highligh in red in Figure 32. Figure 33 shows the resulting edge.

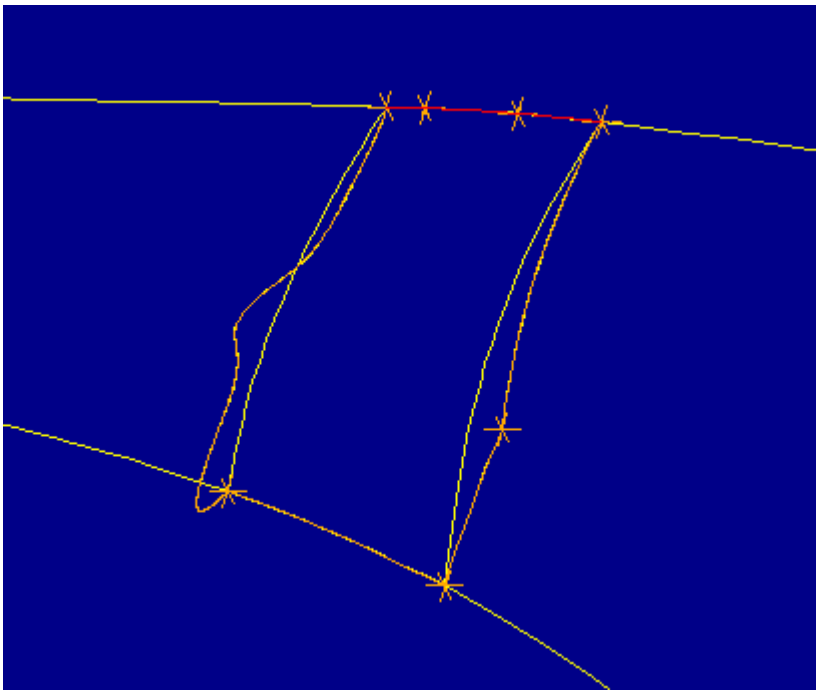

Figure 32

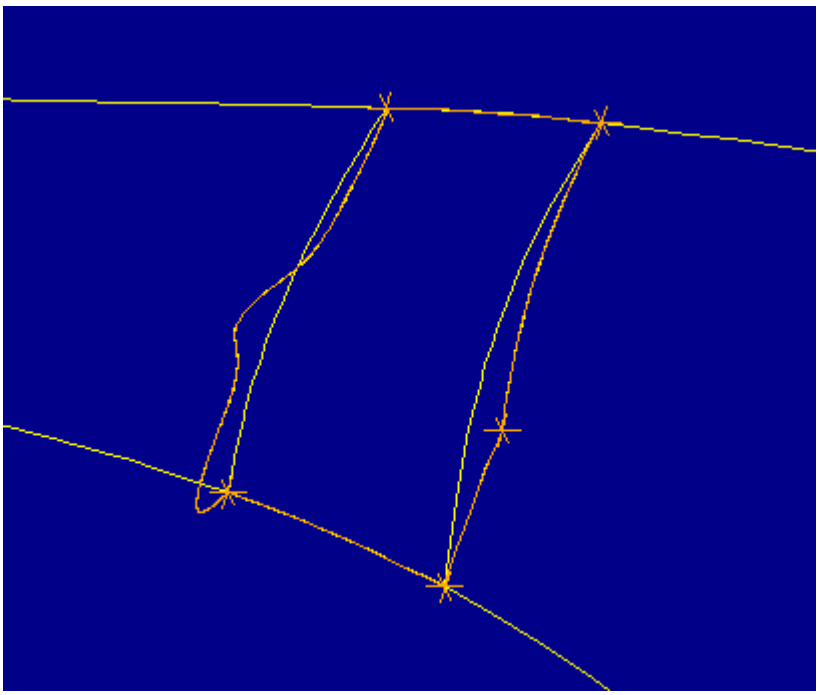

Figure 33

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23. In the MODIFY EDGS menu select **Straighten**. Select the two orange vertices at either end of the left edge and in the CHOOSE menu **Accept** the edge highlighted red in Figure 34. Figure 35 shows the resulting edge. Notice that the new edge does not appear to be straight in this view. The edge does, however, connect the two selected vertices with a straight segment *that conforms to the shape of the surface*.

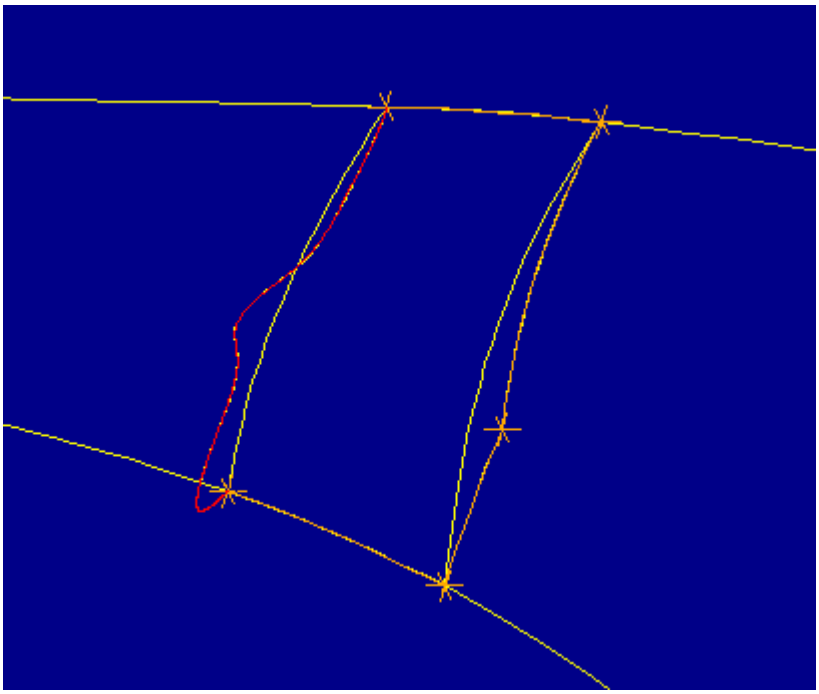

Figure 34

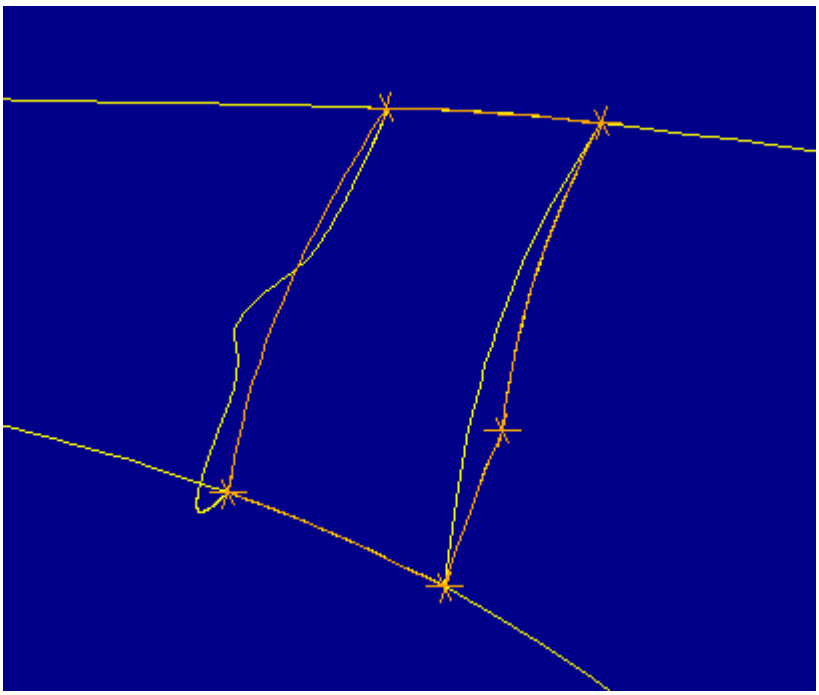

Figure 35

24. In the MODIFY EDGS menu select **Straighten**. Select the two orange vertices at either end of the right edge and in the CHOOSE menu **Accept** the chain highlighte in red in Figure 36. Figure 37 shows the resulting edge.

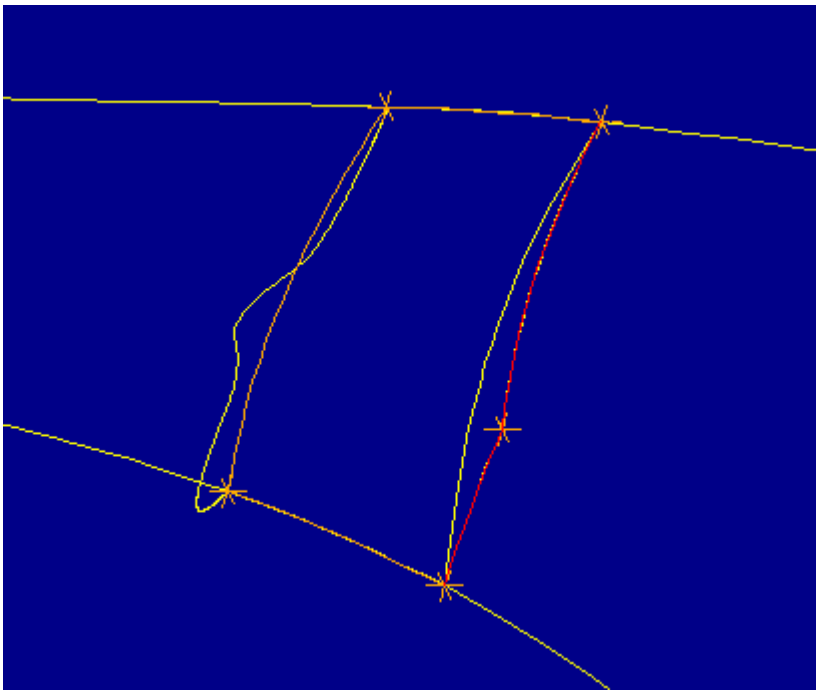

Figure 36

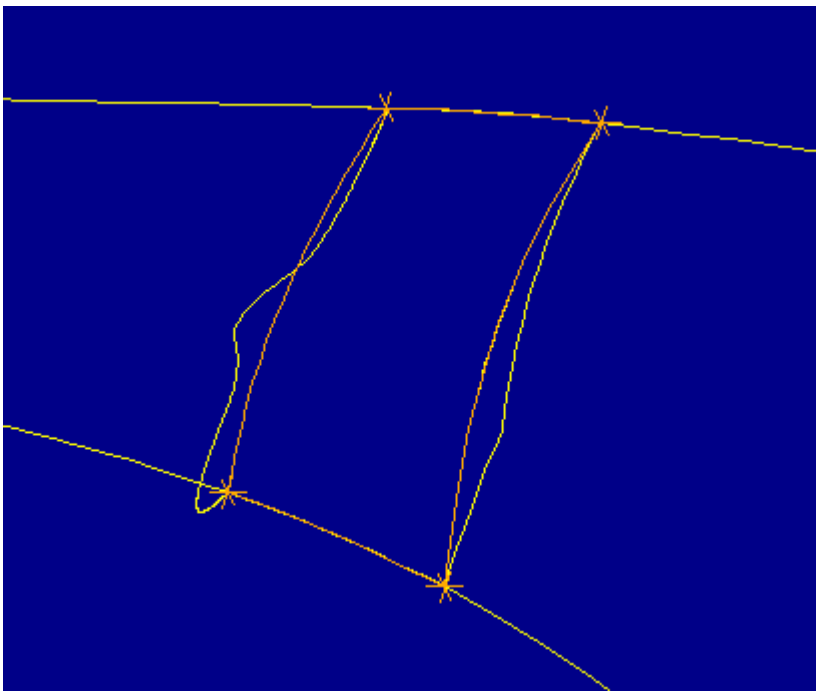

Figure 37

25. Figure 38 shows the replacement contour highlighted in red upon selecting **Preview**. Figure 39 shows the replacement of the original contour upon selecting **Done**. Notice how the edges have been aligned so the surface fits properly into the quilt. Figure 40 shows the current status of the import feature. Also note that the three surfaces that have been edited are not yet joined into the quilt.

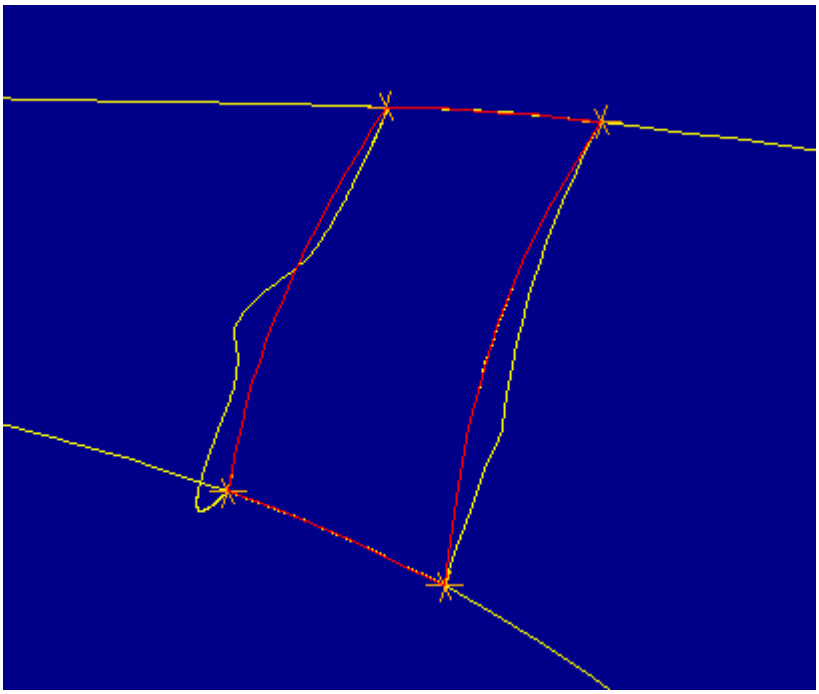

Figure 38

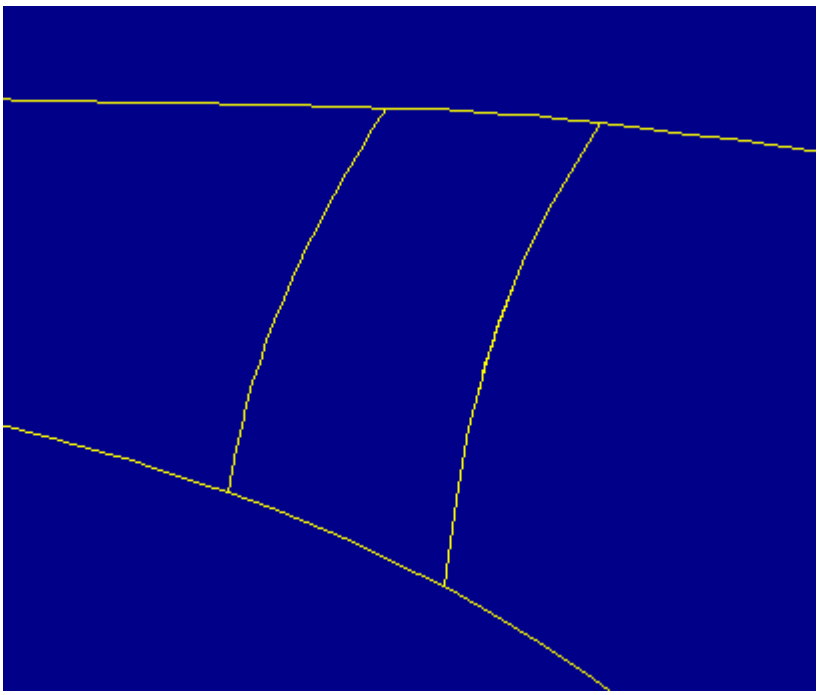

Figure 39

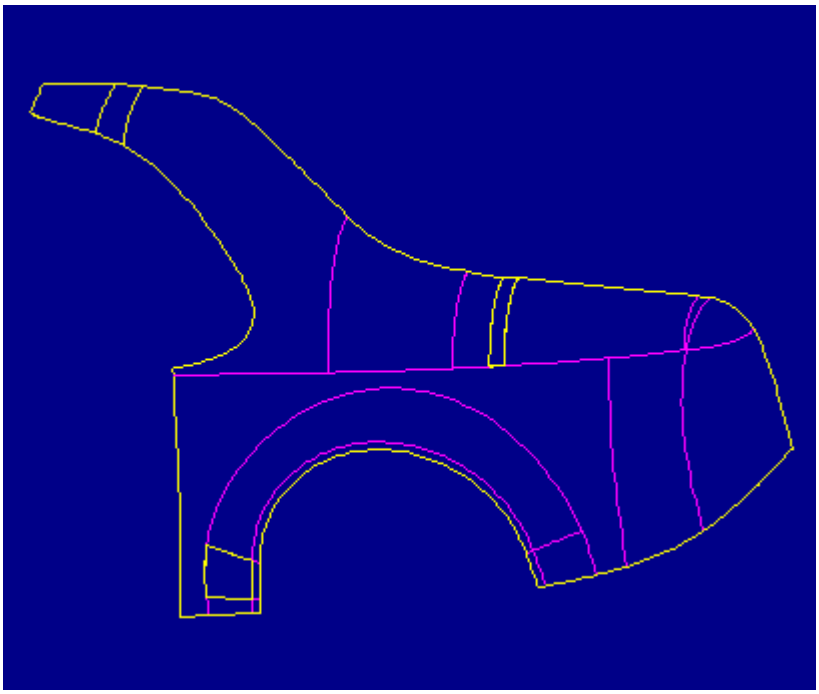

Figure 40

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26. In the SELECT SURF menu select **Done-Return** to regenerate the import feature. Notice in Figure 41 that after returning from the editing process, all surfaces have been joined into the quilt.

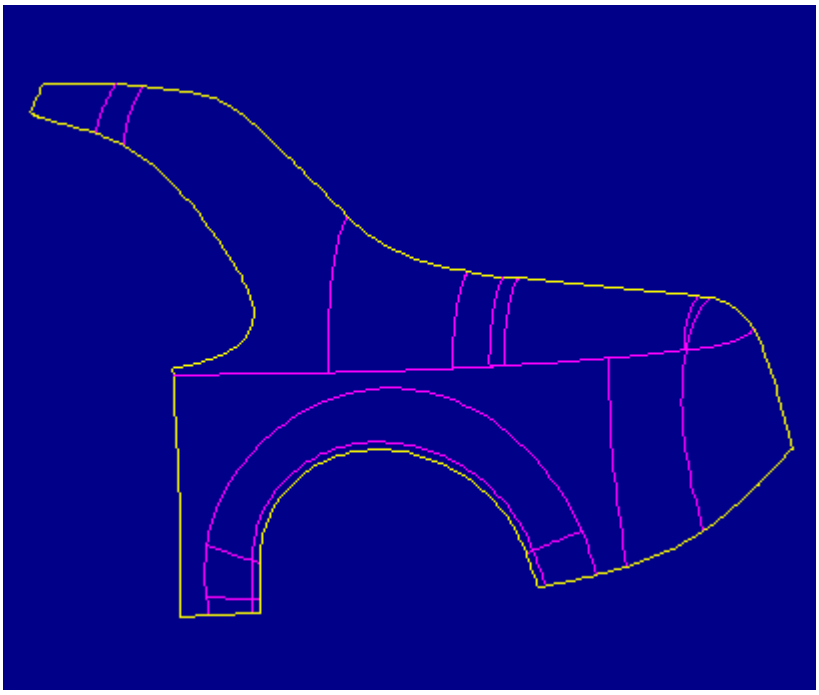

Figure 41

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27. In the REDEF IMPT menu select **Heal Geometry, Manual**, **FixQuiltBndry**. Figure 42 shows the edge chains that have been automatically selected. **FixQuiltBndry** proposes the automatic replacement of these chains/edges that are nearly tangent and almost an isoline with isolines of the surfaces. Note that **FixQuiltBndry** searches all one-sided edges in the import feature for selection (including those that belong to excluded surfaces).

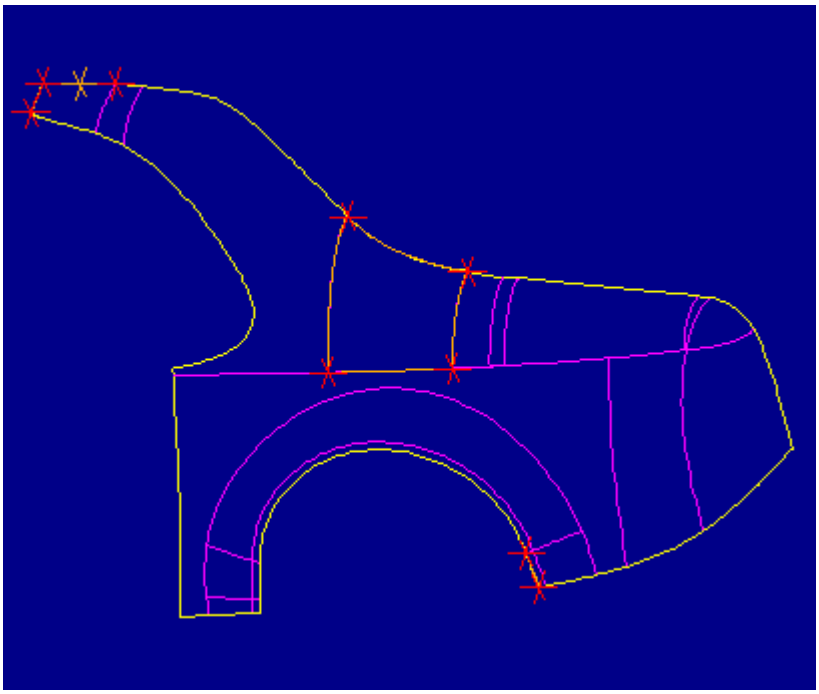

Figure 42

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28. Figure 43 shows an edge chain along the top of the surface that has been selected for replacement. Notice that chain ends are indicated by red crosses and interna vertices are indicated by orange crosses. In the FIXQULTBNDRY menu select **Done**. Figure 44 shows the surface with the highlighted chain replaced. To view the changes, in the REDEF IMPT menu select **Edit Bndry**, the surface, and **From-To** in the CHAIN OPT menu. Figure 45 shows the vertices available for chain selectic Notice that there is no longer an internal vertex along the top edge.

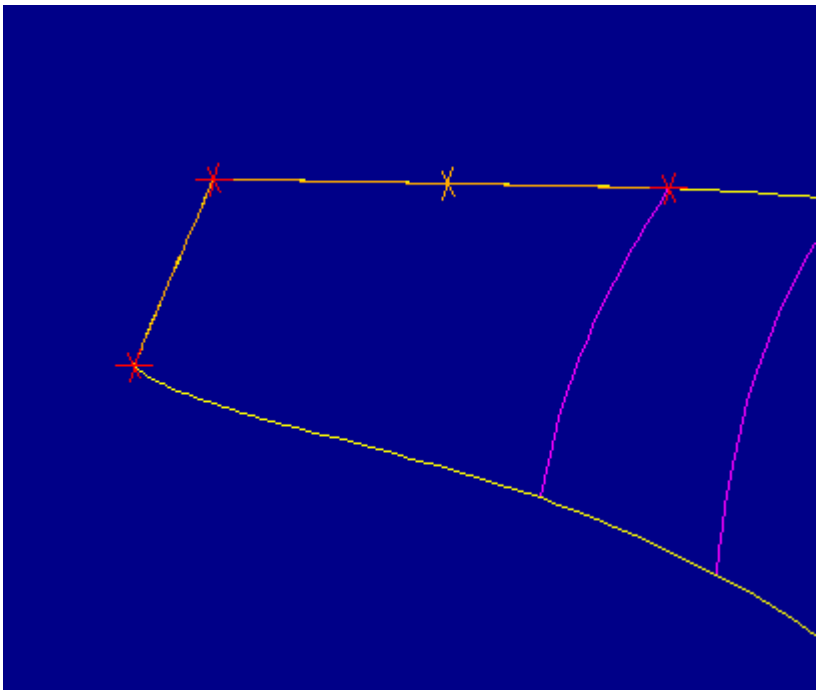

Figure 43

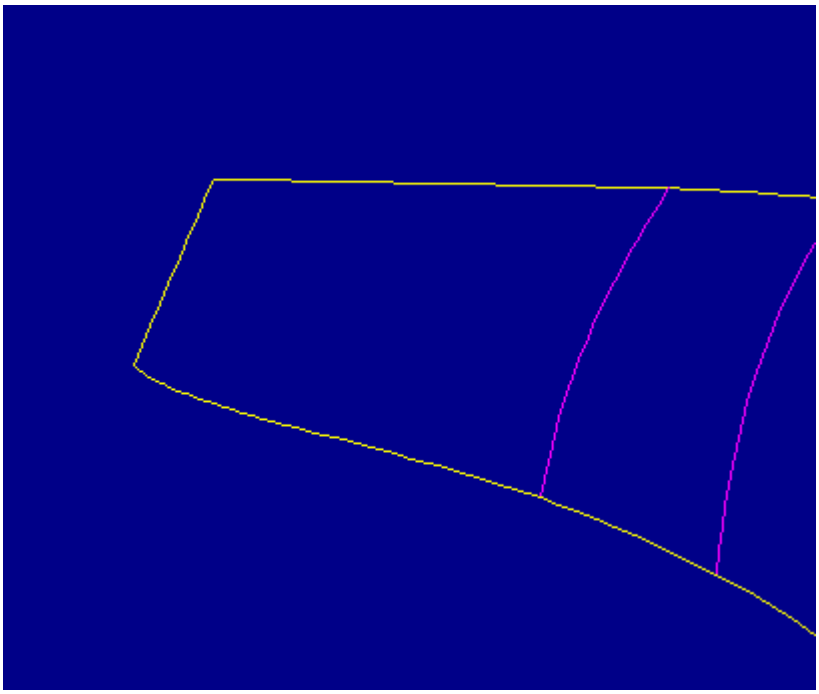

Figure 44

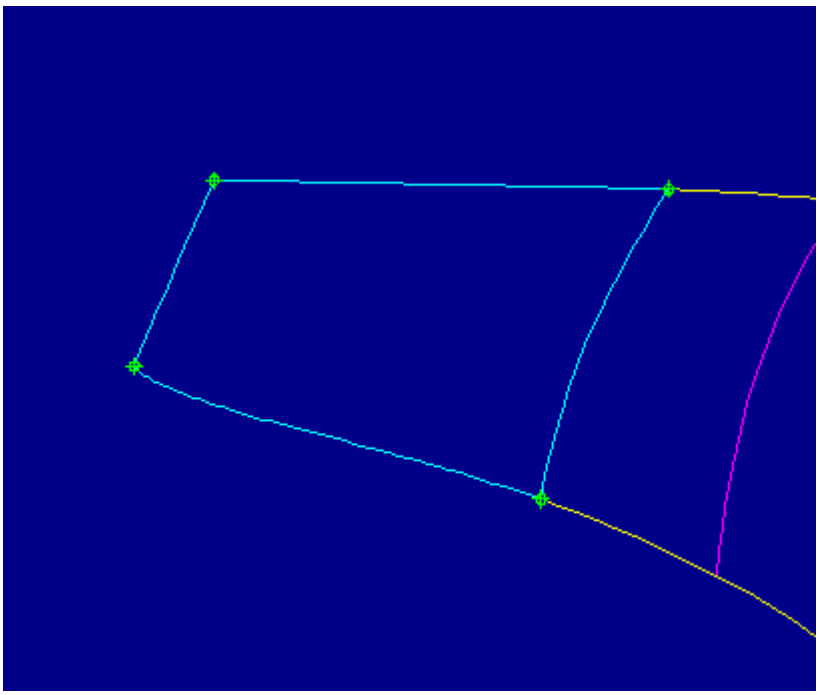

Figure 45

29. In the REDEF IMPT menu select **Fix Bndries**, **FixVertices**. Figure 46 shows that there are no badly aligned vertices present in this quilt.

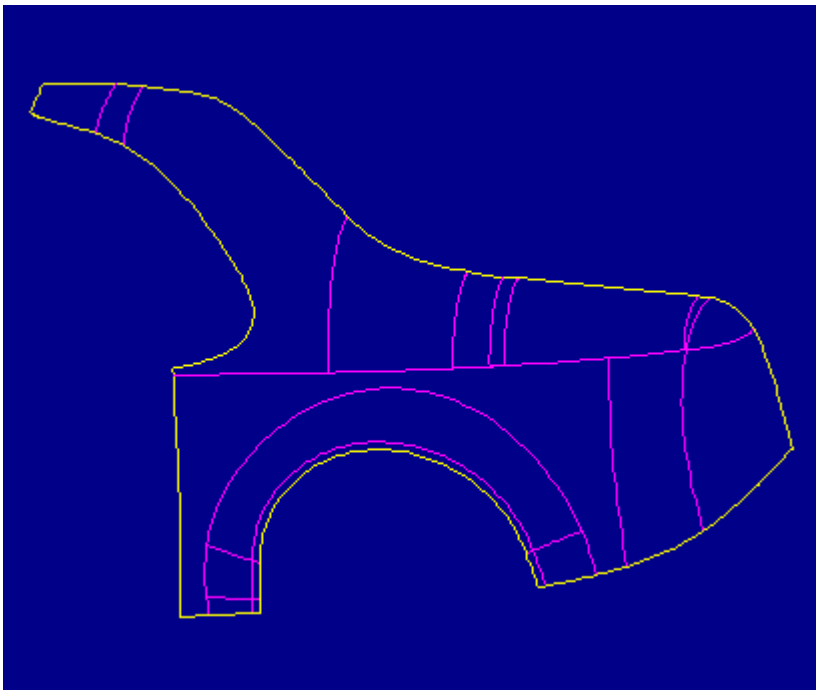

Figure 46

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30. In the FIX OPTIONS menu select **Fix Tangency**, **Auto Select**. The two-sided edge chains that were selected are highlighted in blue in Figure 47. The one remainin magenta chain was not selected because its dihedral angles are larger than the default MaxDihedral value of 10 degrees. To check the dihedral angle of two-sided edges, in the ANALYSIS menu select **Curve Analysis**, **Dihedra Angle**.

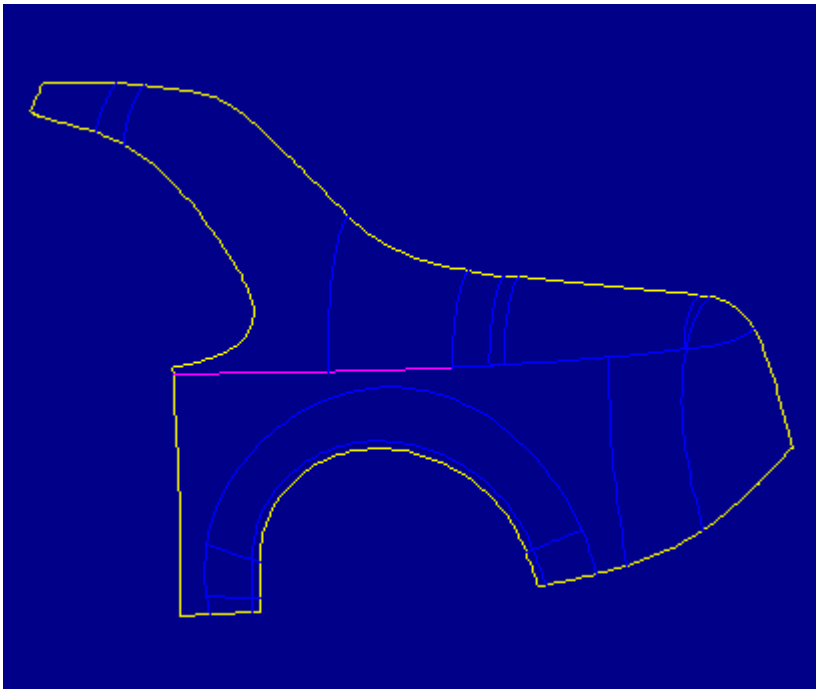

Figure 47

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31. In the SEL CHAINS menu select **FixTangency** to view the proposed changes necessary to establish more consistent tangency between surfaces.

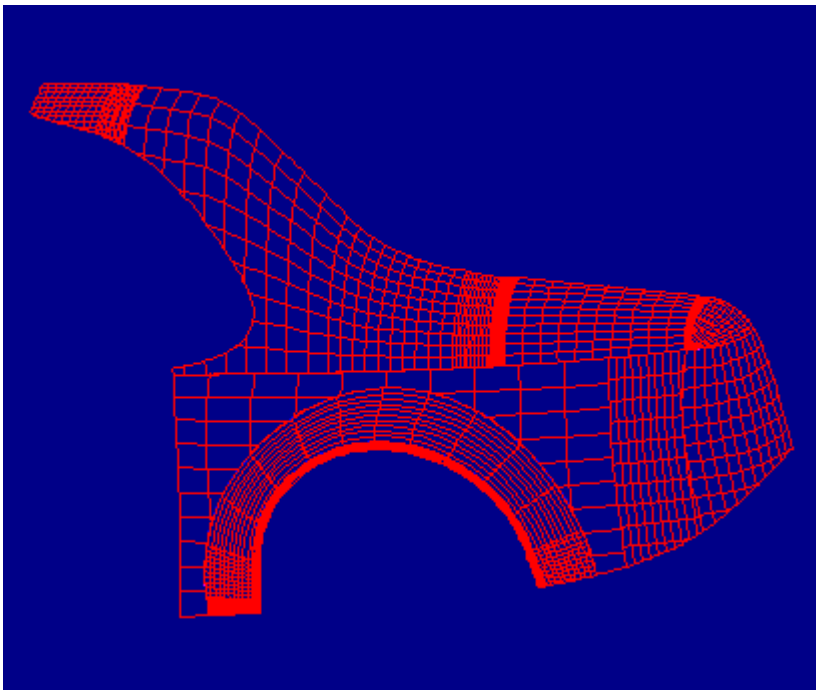

Figure 48

32. In the ACCEPT FIX menu select **Accept** to finish setting tangency. To view the improvements, check the resulting dihedral angles as described above in step 30. Figure 49 shows the final state of the imported surfaces.

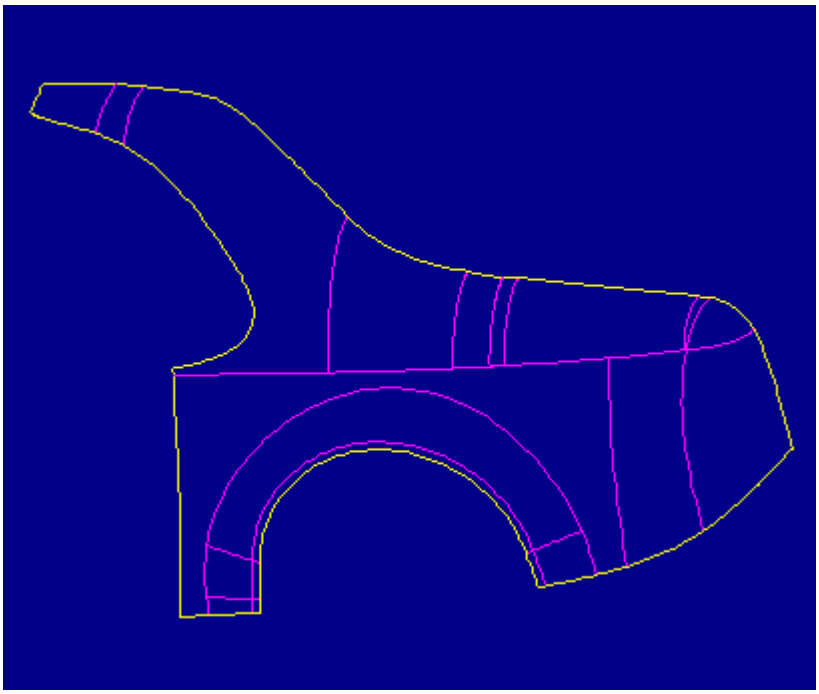

Figure 49