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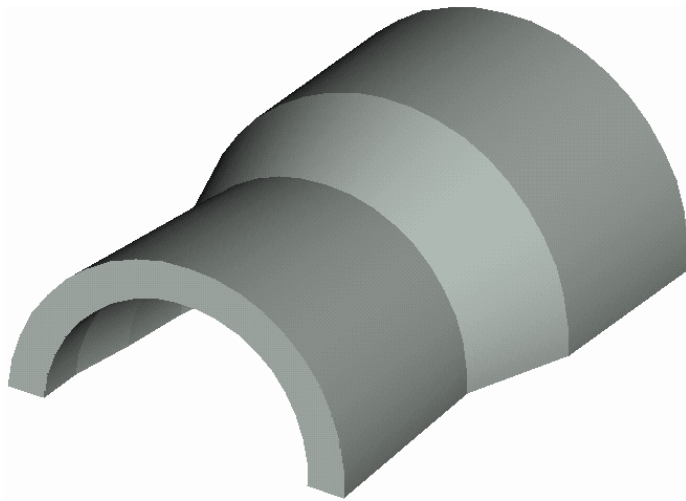
Siemens Power Generation, Inc. - Jupiter, FL

2-D Compressor Vane Hook Geometry Comparisons

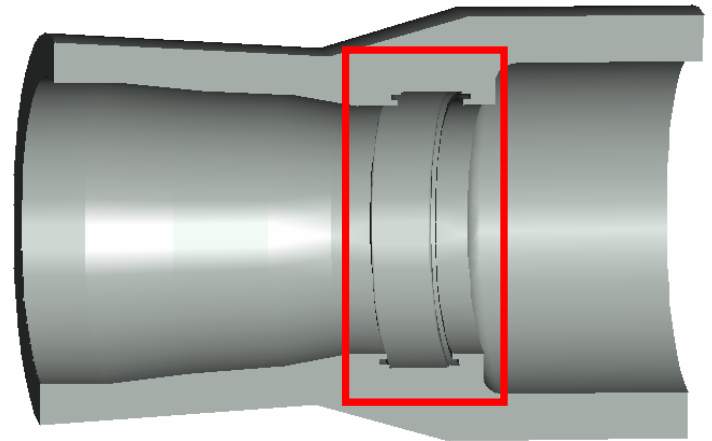
SIEMENS

Project Definition:

Research the application of modified vane platform grooves within the mid-section of a compressor casing to improve its mechanical integrity to accommodate increased loads.

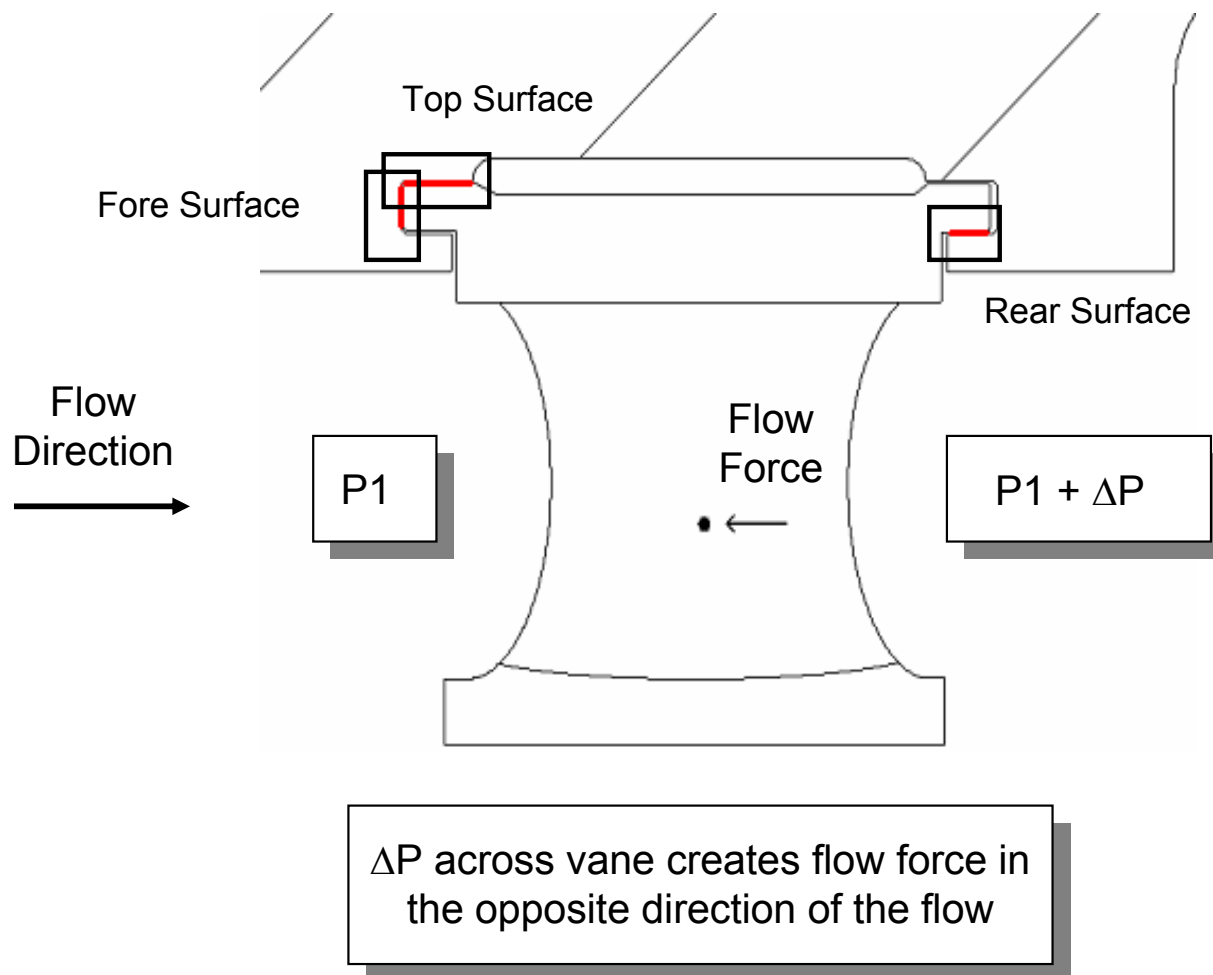


Compressor Casing



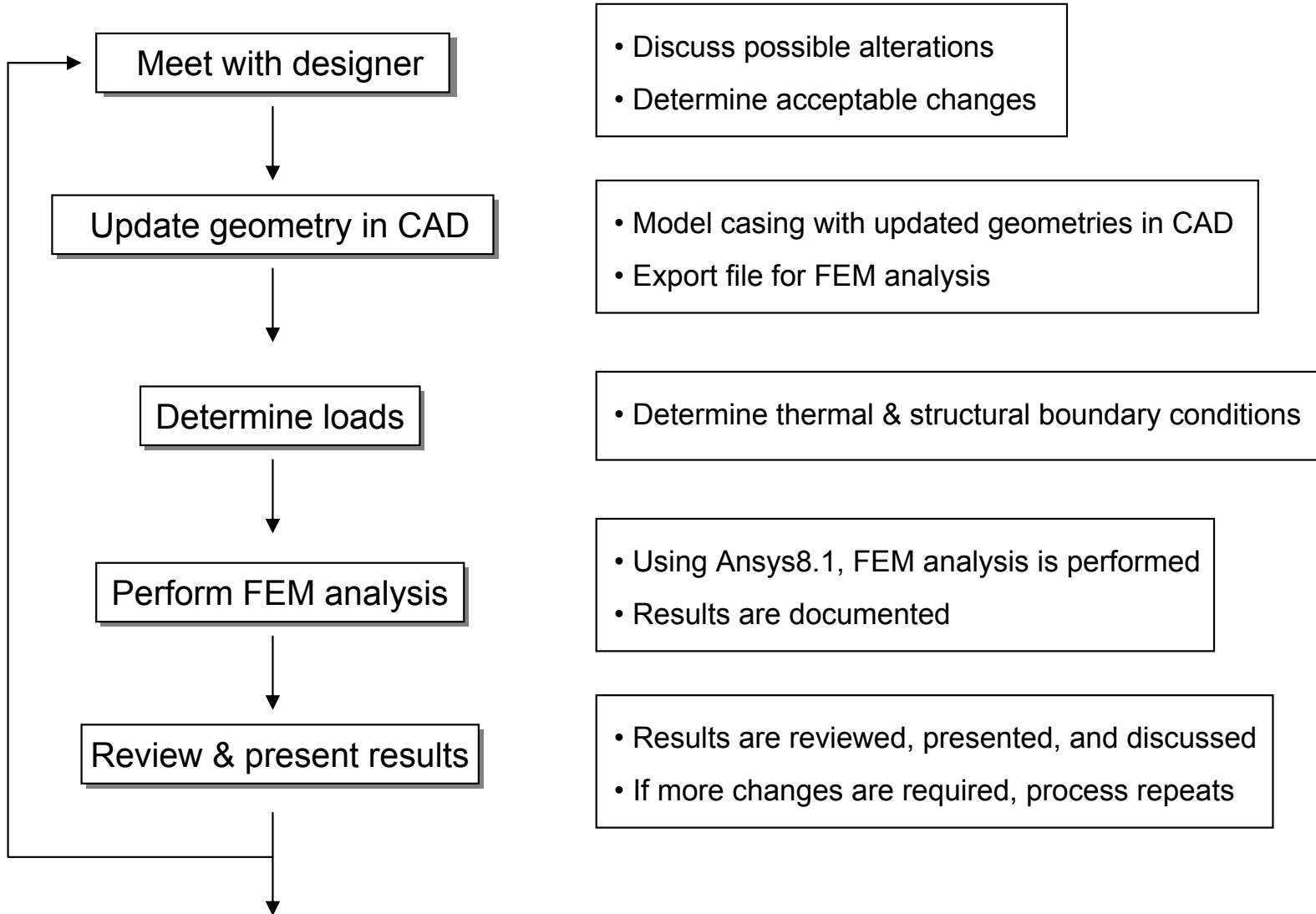
Groove Geometry for
Stator Attachment

Stator axial & radial motion is restricted by 3 bearing surfaces

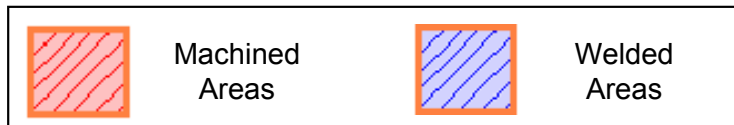
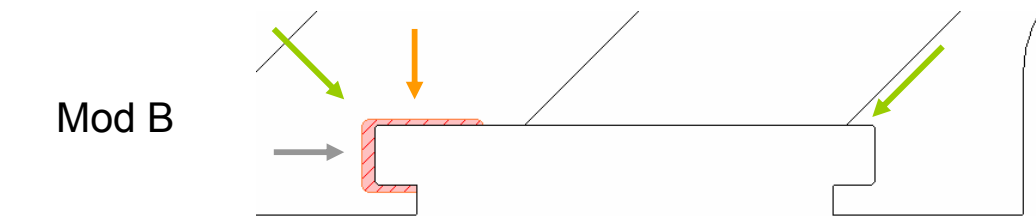
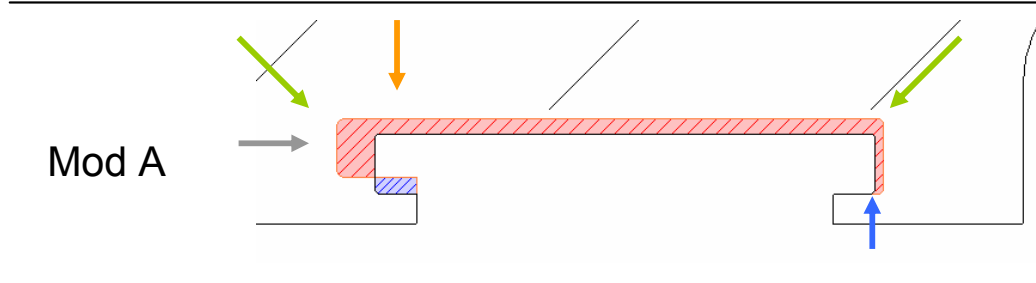
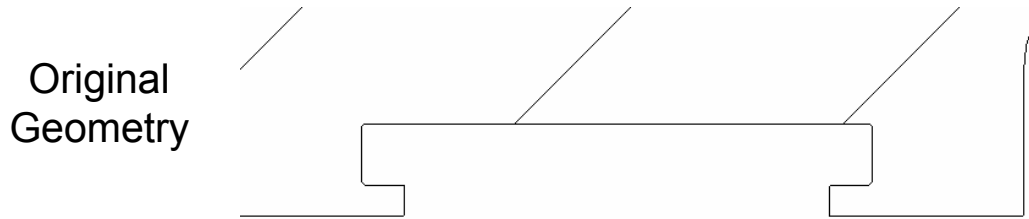


Possible changes

- Modify fillet radii using standard tables (i.e. Peterson) & common machining cutter sizes
- Increase bearing surface area to decrease contact pressure/stress
- Create new groove designs



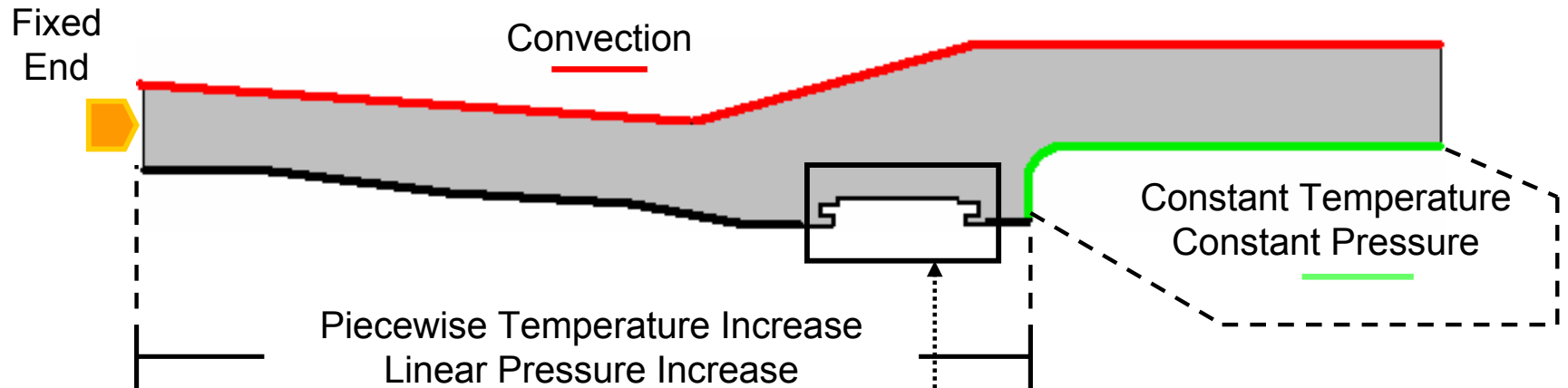
Possible changes to help understand casing mechanical behavior



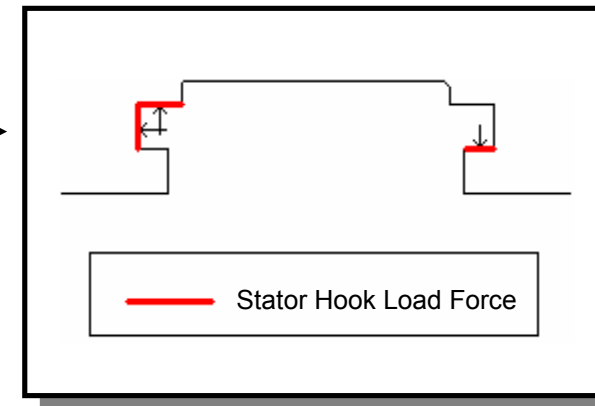
Modifications Considered

- Fillet radius increased
- Top bearing surface increased
- Fore bearing surface increased
- Rear bearing surface increased

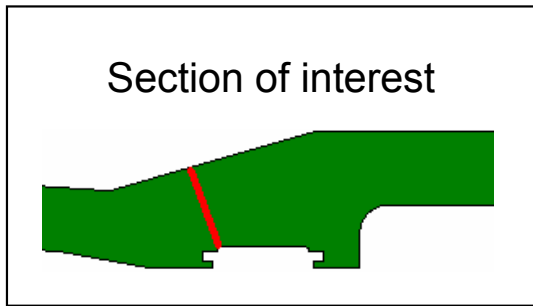
A 2-D cross-section of the casing is created for FEM analysis



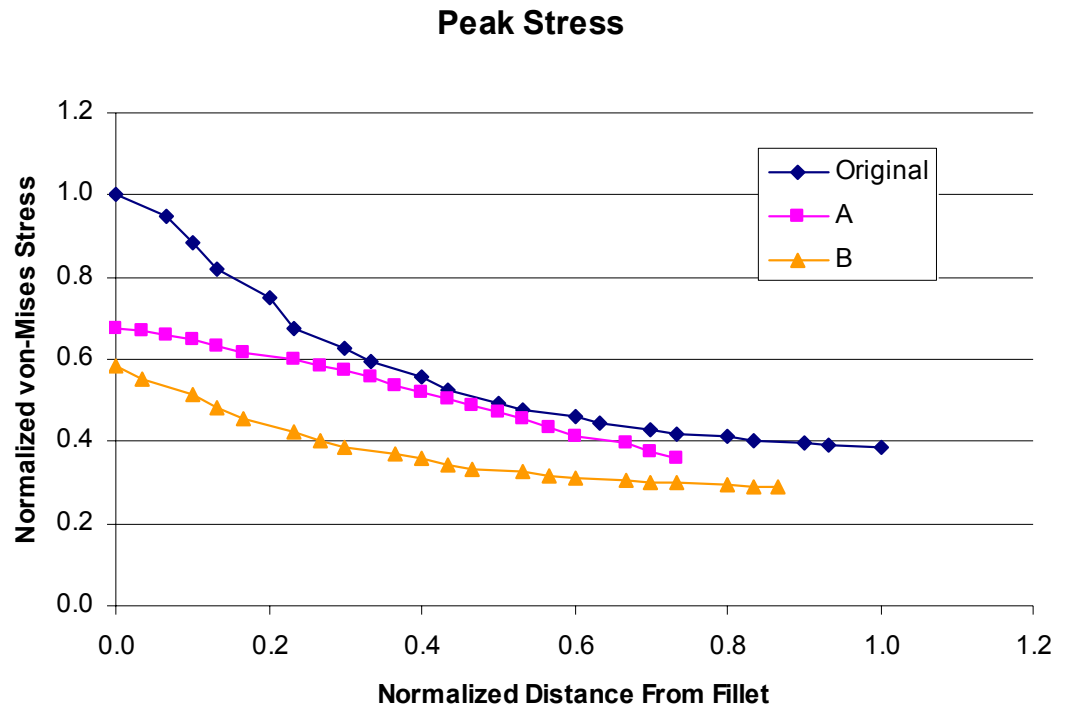
- Axisymmetric FEM solution used
- Loads are applied to the outside faces of the casing



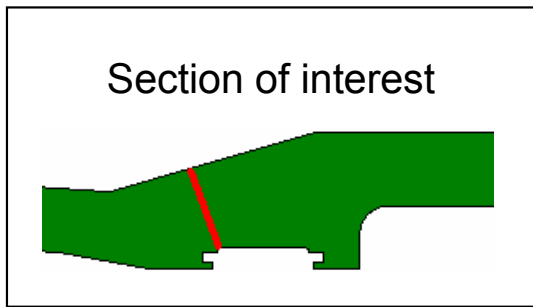
Peak stress reduced ~30-40%



- Increased fillet radius causes peak stress reduction
- Stress is reduced throughout entire section
- Modification 'B' provides more stress reduction



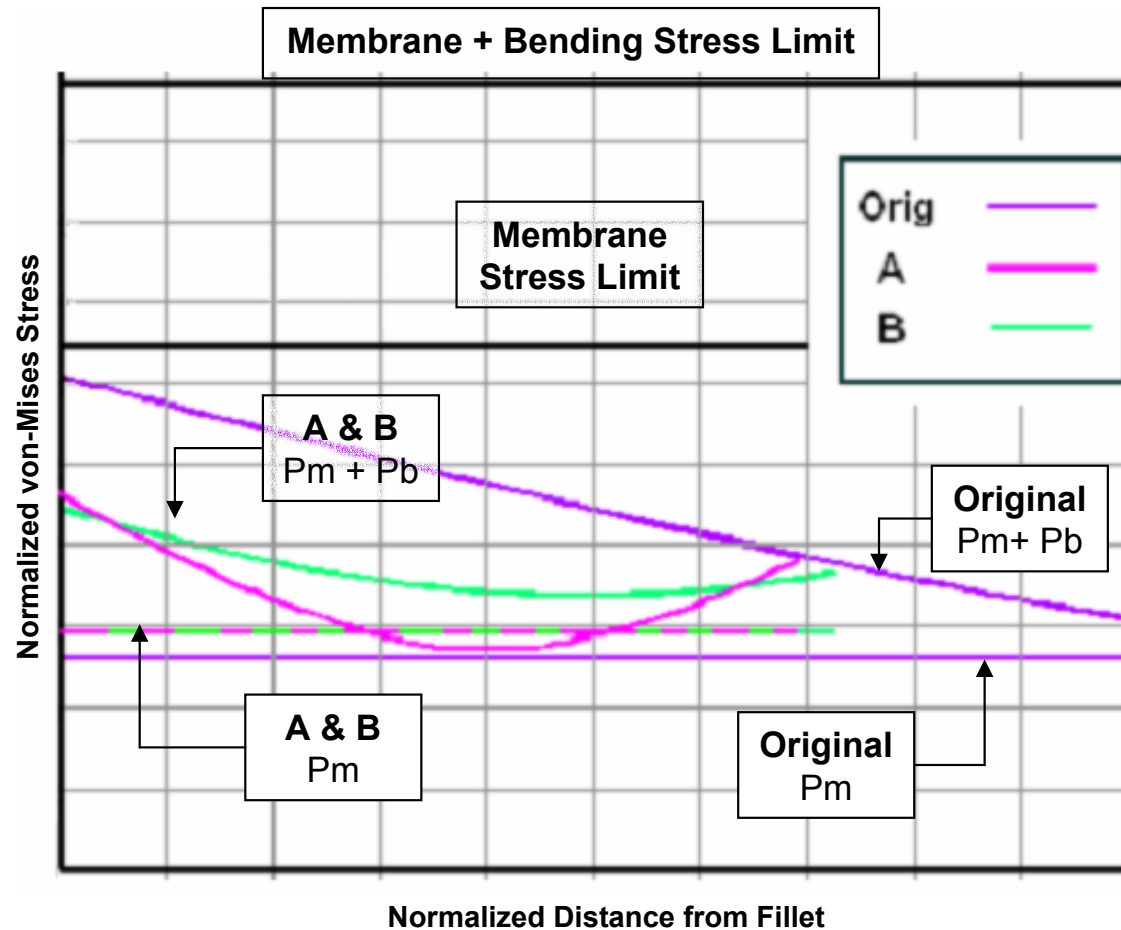
Modified geometry satisfies stress criteria



P_m = Membrane Stress

P_b = Bending Stress

- All three cases satisfy stress limits
- Membrane + Bending stress is decreased ~25%
- Membrane stress increased slightly due to decreased cross section



Results

Larger fillet radii were necessary to reduce peak stress values.

Stress increase due to reduced cross-sectional thickness is insignificant.

All stress values satisfy design allowables.

Future

Final groove geometry will be optimized for manufacturing.

Other geometries will also be compared before a final design is chosen.