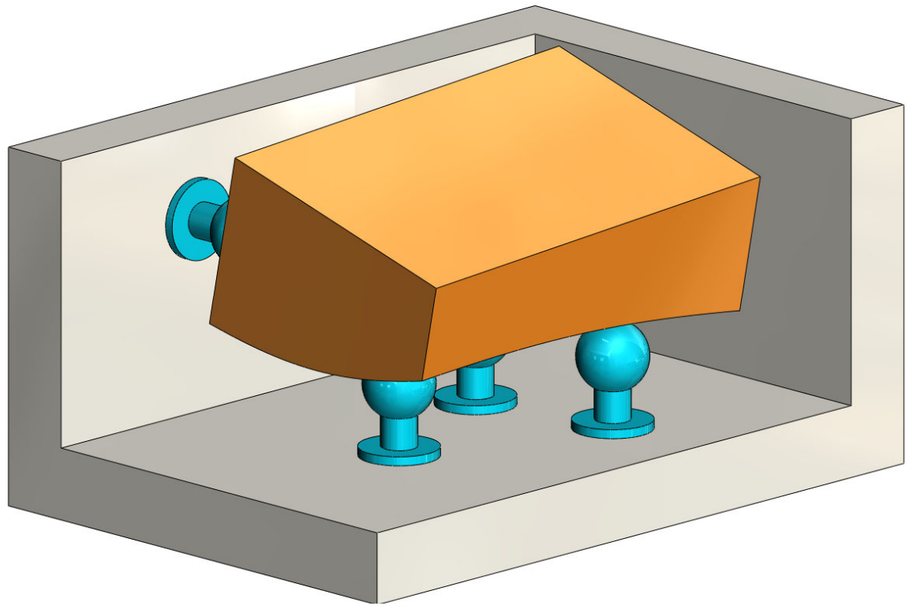
TIPS & TRICKS: FIXTURE DESIGN USING TOOLING BALLS



INTRODUCTION

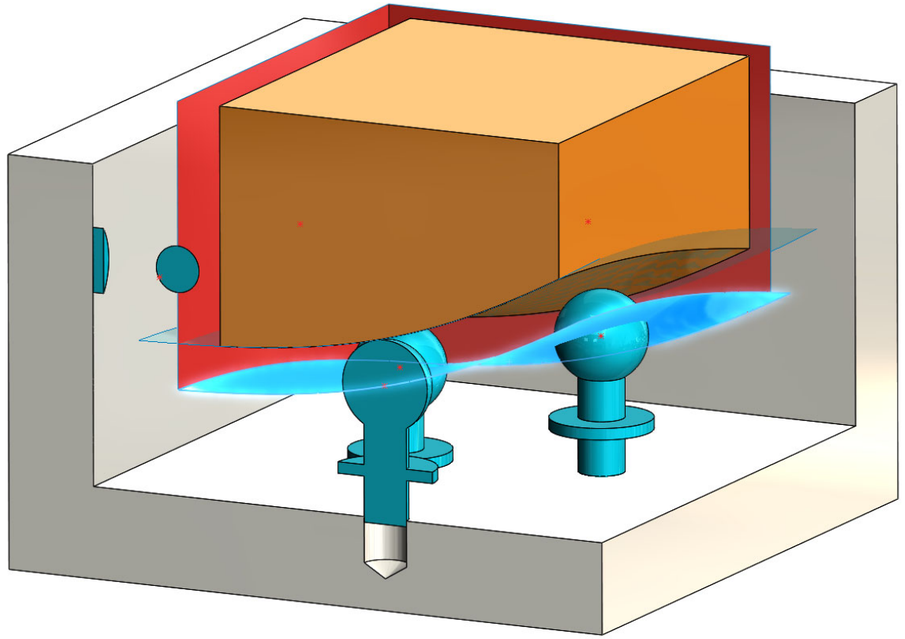
This is a method of aligning tooling balls to support an irregular part to be measured using a fixture. By adding mates into the assembly, we can locate the tooling balls in space, then add support structure below the tooling balls to the measurement fixture itself.

The fixture has tooling balls approximately positioned so we will have 3 points of contact on the irregular surface, two points of contact for the long straight edge of the part, and finally one point of contact for the short straight edge of the part. The three tooling balls on the irregular surface are constrained in the X and Y axes, but not in the Z. The tooling balls for the two straight edges can be fully constrained. Insert the irregular part into the assembly and position it with the irregular surface down (toward the three tooling balls).

The trick is to NOT be use a Tangent mate between the tooling ball and the irregular surface of the part. Multiple tangent mates are not as robust.

SUGGESTED METHOD

1. Create a sketch in the tooling ball part that adds a sketch point at the center of the tooling ball.
2. Next offset a surface in the part to be measured from all the surfaces that will contact the tooling balls the same distance as the radius of the tooling ball.
3. Then mate the sketch points on each tooling ball coincident to the offset surfaces of the irregular part in the 3-2-1 order (first the 3 on the irregular surface, then the 2 on the long edge, followed by the 1 on the short edge).
4. Lastly mate the flat surface opposite the irregular surface parallel and an appropriate distance from the X-Y plane so the three tooling balls are optimally positioned to add material to the fixture supporting the three tooling balls in contact with the irregular surface.



This is also a good example of what you can do in SOLIDWORKS that has no corollary in the real world. Adding an offset surface, creating points in the center of tooling balls, and positioning them coincident are only done with software.

An interesting side note; this method was actually thought up during a live SOLIDWORKS User Group meeting question and answer session (Hint, find a local SOLIDWORKS User Group here).

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