Prairiefire
CONSULTING, INC.

CASE STUDY

# Frame alignment & weld gaps

**Fortune 500 Ag & Construction Equipment Company**

## AT A GLANCE

**Problem:**
Large frame weld gap variation during fixture layup process requiring too many weld passes, preventing robotic weld and achieving only half of the required throughput per cell to meet production goals.

**Objective:**
Provide part level tolerances and datum schemes to ensure proper weld gap is achieved during weld tack layup.

**Solution:**
Prairiefire identified multiple design characteristics that contributed to variation. Without increasing tolerance requirements, the weld fixture and process were modified to provide a more stable pattern for tack.

**Result:**
Engineering was not required to change the design to achieve the goals, although many prints were changed to better communicate critical design characteristics. Manufacturing was then able to update fixtures matching engineering requirements, and variation was pushed from critical weld edges to inconsequential surfaces.

Products pictured are representative and not necessarily the products for which the work was performed


**support@pfcae.com**
**www.pfcae.com**
**224.484.0411**


## SUMMARY


Our customer was producing half of the required cell throughput to meet production demands; engineering and manufacturing could not identify the root cause of the weld gap problem.

Prairiefire created a model that represented the parts as engineered, and the weld fixture as designed and operated. We additionally represented parts as measured by QC. With all the data and parties involved we determined that the engineering prints did not accurately represent the system requirements and that the tack fixtures also did not match the current engineering intent, nor the actual engineering requirements.

We then looked at the sensitivity of the system to each operational and manufacturing requirement. By working with engineering, the functional requirements of the system were communicated using GD&T on the prints from the system level down through the part levels. By working with manufacturing, purposeful bias was used so that the weld fixture clamps would close gaps every time instead of possibly opening gaps, and the fixture points and process were also adapted to purposely push uncontrolled variation away from the weld gaps.

By working with engineering, inspection, and manufacturing, we were able to help the customer achieve their production goals with minimal changes to drawings and fixtures. Also, by solving the issue on both sides of the line, manufacturing and engineering change costs were minimized.


## BENEFITS

- The highly coordinated solution targeted multiple simultaneous low cost changes to fully solve the problem. This was achieved by seeing all sensitivities and contributors from the design, manufacturing, and inspection process in the same model.
- Changes were made within engineering requirements and standard manufacturing tolerances to build the best solution while reducing required inspection.
- New engineering technique used to predict and control weld gap will assist in future robotic frame design.

Prairiefire has 20 years of industry experience helping improve performance, quality, and fit-up through multi-physics design and analysis of variation. Not only do we do the work, but we also are 6σ certified and have taught Sensitivity-Based Design, GD&T, and Dimensional Management to hundreds of engineers in 8 countries. Let us teach you our methods this year.