

CETOL 6σ HEAVY INDUSTRY STUDY

Root Cause Analysis with CETOL 6σ Eliminates the Guessing

SEE WHAT YOU'RE MISSING

Heavy equipment, like bulldozers, machinery, farming equipment, and the like, has a very interesting challenge when it comes to warranty work. You just can't send back a 20-ton piece of equipment when there's a warranty issue. Not only is it large, but it is expensive to return. So, in most cases, warranty work must be done in the field. This work must be done efficiently minimizing the time investment to fix a problem. The worst scenario is when the assumed "fix" to the problem turns out to not be the actual root cause issue. This generates additional service calls, increasing the total cost to resolve the warranty claim.



One customer of CETOL 6σ utilizes a very strategic approach to minimize the costs associated with warranty claims. Simply stated, root cause analysis is performed using CETOL 6σ. When an issue is reported a root cause analysis is initiated. It is natural to 'cast a broad net' and begin measuring parts or looking into process changes to identify what may be the reason for the failure.

With CETOL 6σ, engineers can cast a "strategic net" by using SENSITIVITY DATA. Sensitivity data identifies the most sensitive areas of an assembly. In CETOL 6σ, this would include dimensions and assembly process variation like the variation involved in welding. With knowledge of the failure condition discovered in the field, the engineer can review a current CETOL 6σ analysis, create a new analysis, or simply add a measurement to the existing analysis that represents the failure mode. The analysis can then be rerun, with sensitivity data calculated in a matter of seconds, or a couple minutes for extremely large analyses.

By ranking sensitivity data in Pareto fashion, users of CETOL 6σ can quickly identify what areas of the assembly to investigate. For the data on the right, it makes sense to begin investigating the top eight sensitivities since the next highest sensitivity is approximately 9 times smaller. Our customer is able to identify the true root cause issue more quickly and accurately, thus minimizing several important considerations including downtime for the customer, cost of repair, and avoidance of future warranty claims.



Name	Sensitivity
.../OU-94343/1/HNGE BRKT/1 / Rivet pivot to -A- mate to back bar / TY	0.793253 ind/inch
.../OU-94343/2/HNGE BRKT/1 /R outer pivot to -A- mate to back bar / TY	0.793253 ind/inch
... / Back Bar/1 / Back Bar/1 / Rivet rivet 2 to bend / TY	0.681247 ind/inch
... / Back Bar/1 / Back Bar/1 / Rivet rivet 1 to bend / TY	0.681247 ind/inch
.../HNGE_MDU-94343/2 /HNGE BRKT/1 / rivet 2 to C / TY	0.681247 ind/inch
.../HNGE_MDU-94343/1 /HNGE BRKT/1 / rivet 4 to C / TY	0.681247 ind/inch
.../OU-94343/1 /HNGE BRKT/1 / Rivet pivot to C / TY	0.608761 ind/inch
.../OU-94343/2 /HNGE BRKT/1 /R outer pivot to C / TY	0.608761 ind/inch
... / Back Bar/1 / Back Bar/1 / Rivet rivet 1 to bend / TY	0.072486 ind/inch
... / Back Bar/1 / Back Bar/1 / Rivet rivet 2 to bend / TY	0.072486 ind/inch
.../HNGE_MDU-94343/1 /HNGE BRKT/1 / rivet 3 to C / TY	0.072486 ind/inch
.../HNGE_MDU-94343/2 /HNGE BRKT/1 / rivet 1 to C / TY	0.072486 ind/inch

By using this process, our customer estimates a savings of over \$4 million per year.

