Statistical Problem Solving

A Department of Defense Manufacturing Company

Case Studies

Abstract

The turret assembly when assembled into the M-ATV was not functioning as intended. The problem as presented to the OEM was that the system level TIR was excessive at the stop ring in the vehicle, and that if controlled to less than .060" at the system level, the unit would function properly. We were asked to converge down to the source of the problem and statistically prove root cause to a confidence level of 95%.

Challenge

Inspect and segregate fully assembled BOB and WOW vehicles so we could swap components between the units. The delivery schedule for M-ATV was aggressive and holding vehicles was difficult. Working at the extremes of the distribution of interest allowed for small sample sizes to be used.

Execution

- Disassemble and reassemble BOB and WOW units while maintaining rotational origin to determine if the assembly process was significant (Torque and tightening sequence). It was not.
- Disassemble and reassemble BOB and WOW units while rotating the internal stop ring 90°. This action caused BOB to degrade and WOW to improve they became equal in run out values. This shows the main effect lives within the "parts" and not process.
- A two level (BOB and WOW) three factor test was designed with 16 replicates that contrasted the best and worst suspected values of the parts. The roof was run in a flat state as opposed to being significantly bowed, the bearing was run at high and low levels of torque, and the stop ring was included with less than .030" run out at the BOB end and with over .100" run out at the WOW end.

Result

The test showed at 95% confidence that the stop ring was the main effect and neither the roof or bearing at either end of their respective distributions was significant. All effort at that time was focused on improving the dimensional capability of the stop ring.