Ruptured Case in the M249 SAW

A Finite Element Analysis

Who am I?

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Introduction

- Modeling and Simulation saves time and money
- Impractical to do real world tests on some failures

What Happened

- Incidences of the M855 cartridge case rupturing during normal firing of the M249 Saw
- Cause was unable to be determined during live fire

What Do We Need to Know

- Do the tolerances of the cartridge case need to be more stringent?
- If so, which tolerances are causing the problem; and how much do they need to changed?

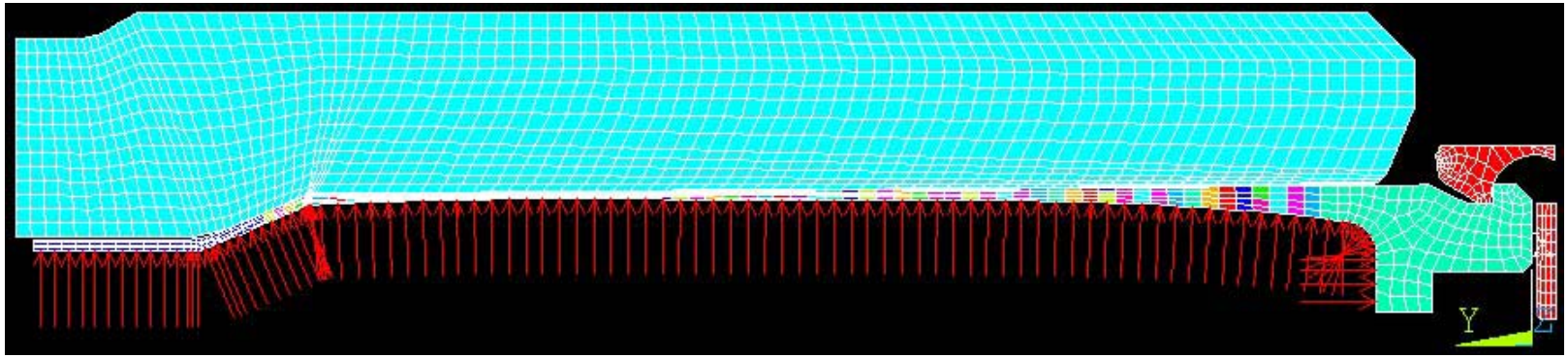
What Can Contribute

- Separate Tolerances
- Tolerance Stack-Up
- Hardness Gradient

Setup

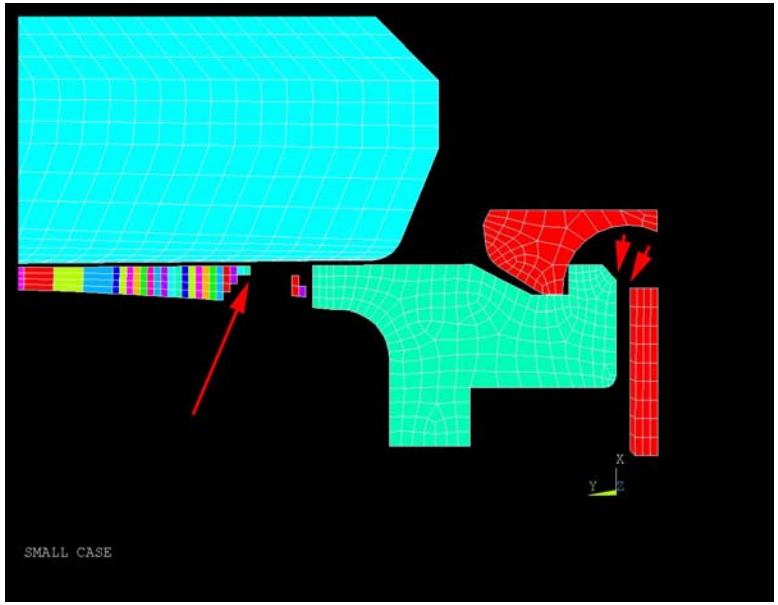
- Geometry
- Internal Pressure from Propellant
- Extraction taken from T-D Curve
- Materials – Brass Hardness Gradient

Preliminary Modeling



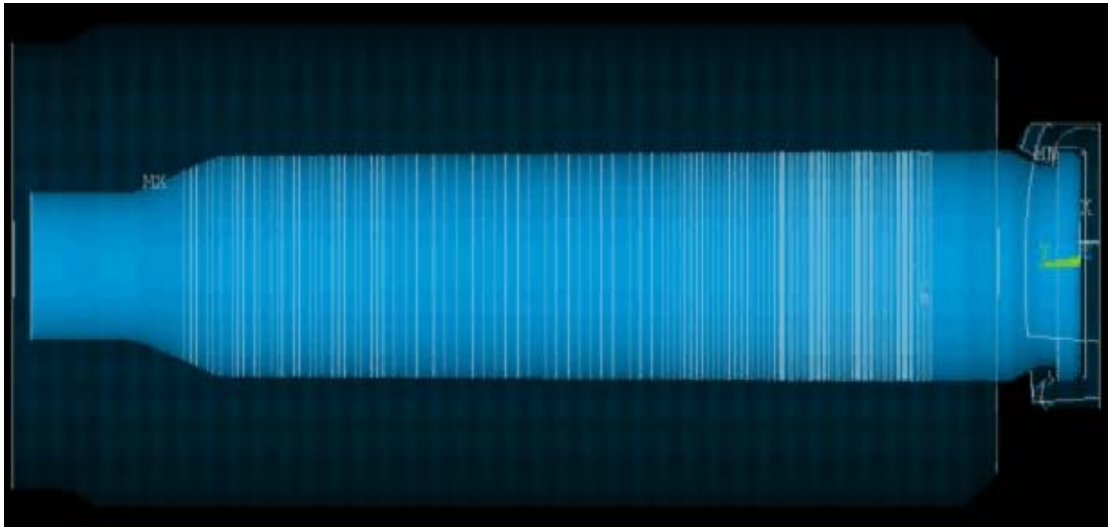
- Axi-symmetric Model
- Several scenarios were considered

Observations



- No rupture in nominal case
- Longitudinal stretching causes rupturing
- All hardness gradients ruptured at same location and time

Secondary Results



- 3d Results corresponded to axi-symmetric models
- Brass material validated to 0.08% error

Conclusions

- Space between the back of the case and the Bolt Face causes case rupturing
- Weapon head space is measured, case tolerance is limited to -0.006in
- Head space gauges measured in 0.002in increments

What can be Learned

- Most cartridge cases are generally the same shape so will behave approximately the same way