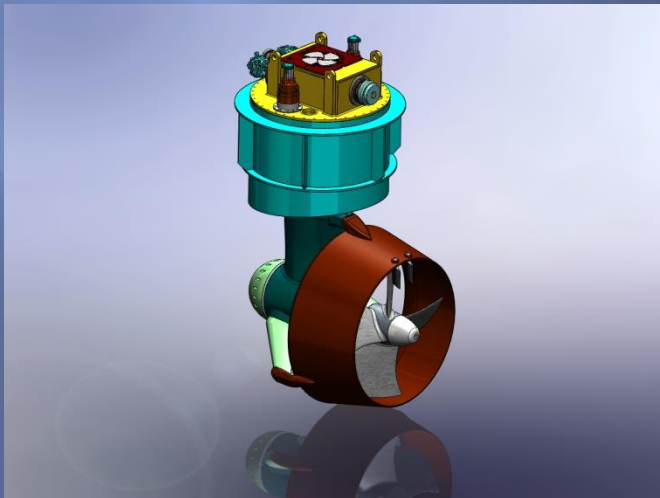


# INTRODUCING THE SPS 1500 AZIMUTH DRIVE

SOUND PROPELLER SYSTEMS, LLC  
SEATTLE, WASHINGTON  
USA



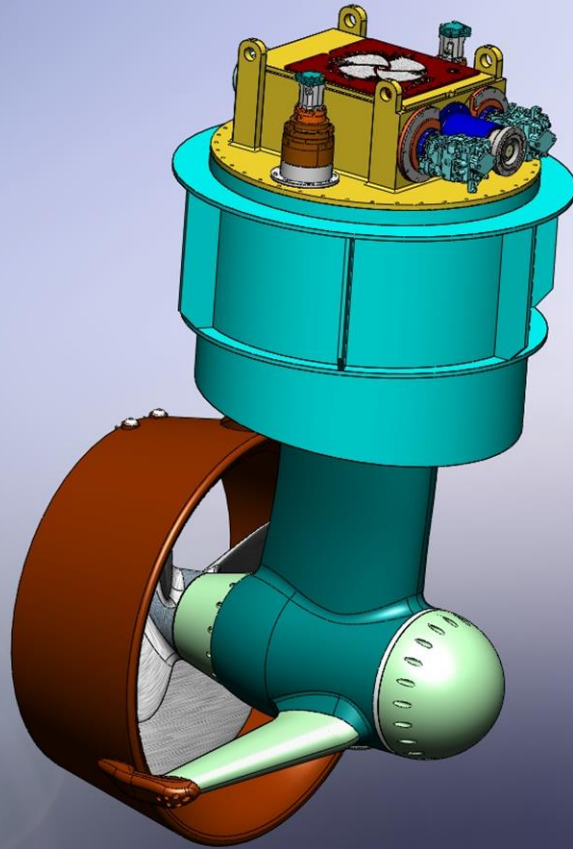
# Critical Path Elements for Production

- Domestic Supply chain must provide...
  - Gears
  - Bearings
  - Castings
  - Forgings
  - Controls
  - Propellers
  - Seals

# Product Design

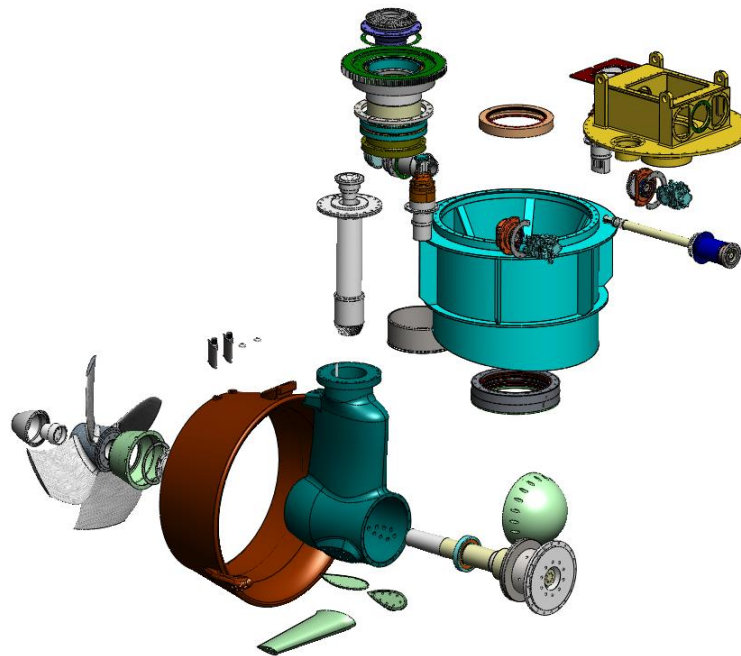
- Applied practical experience
- Vendor base input
- Consulting input
- Customer input
- Computer modeling verification
- ABS Compliance

# Virtual Design Model

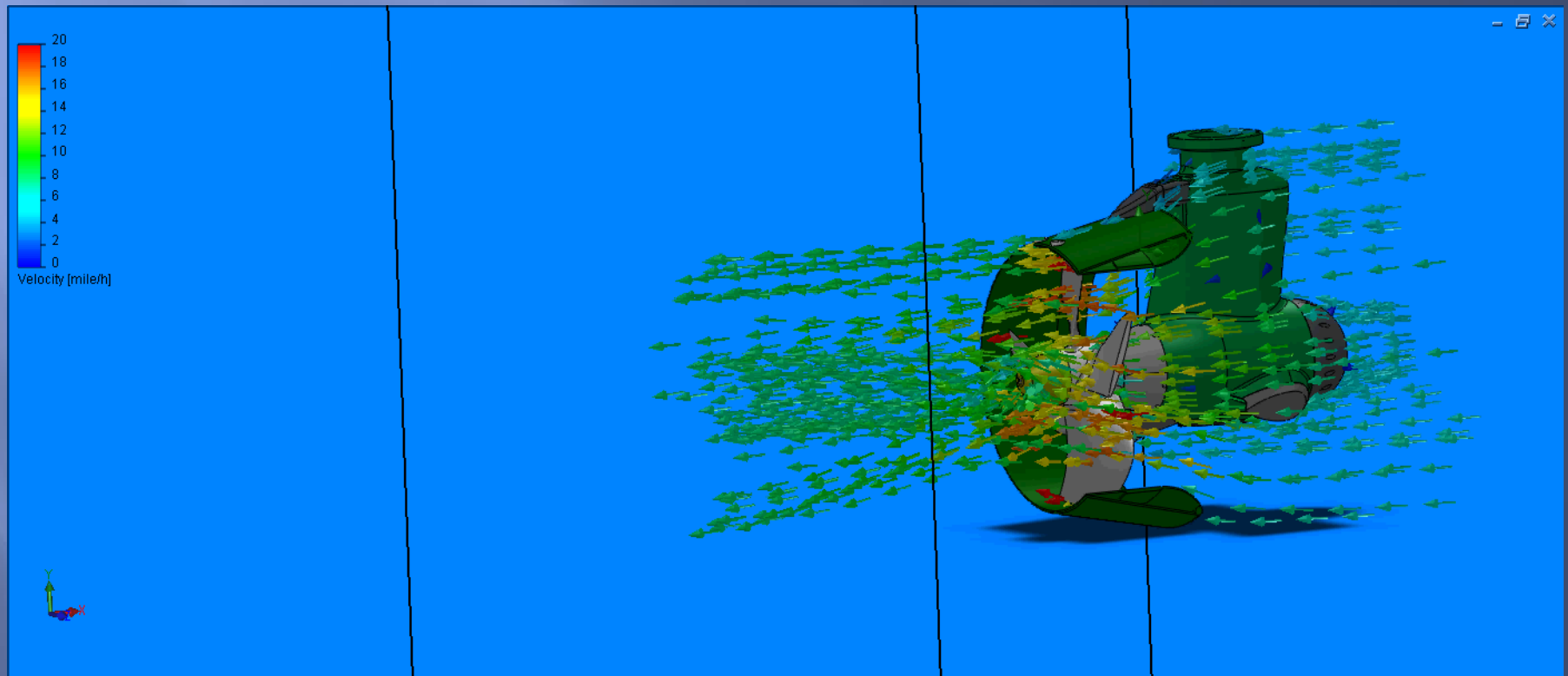




# The Modular Cartridge Design

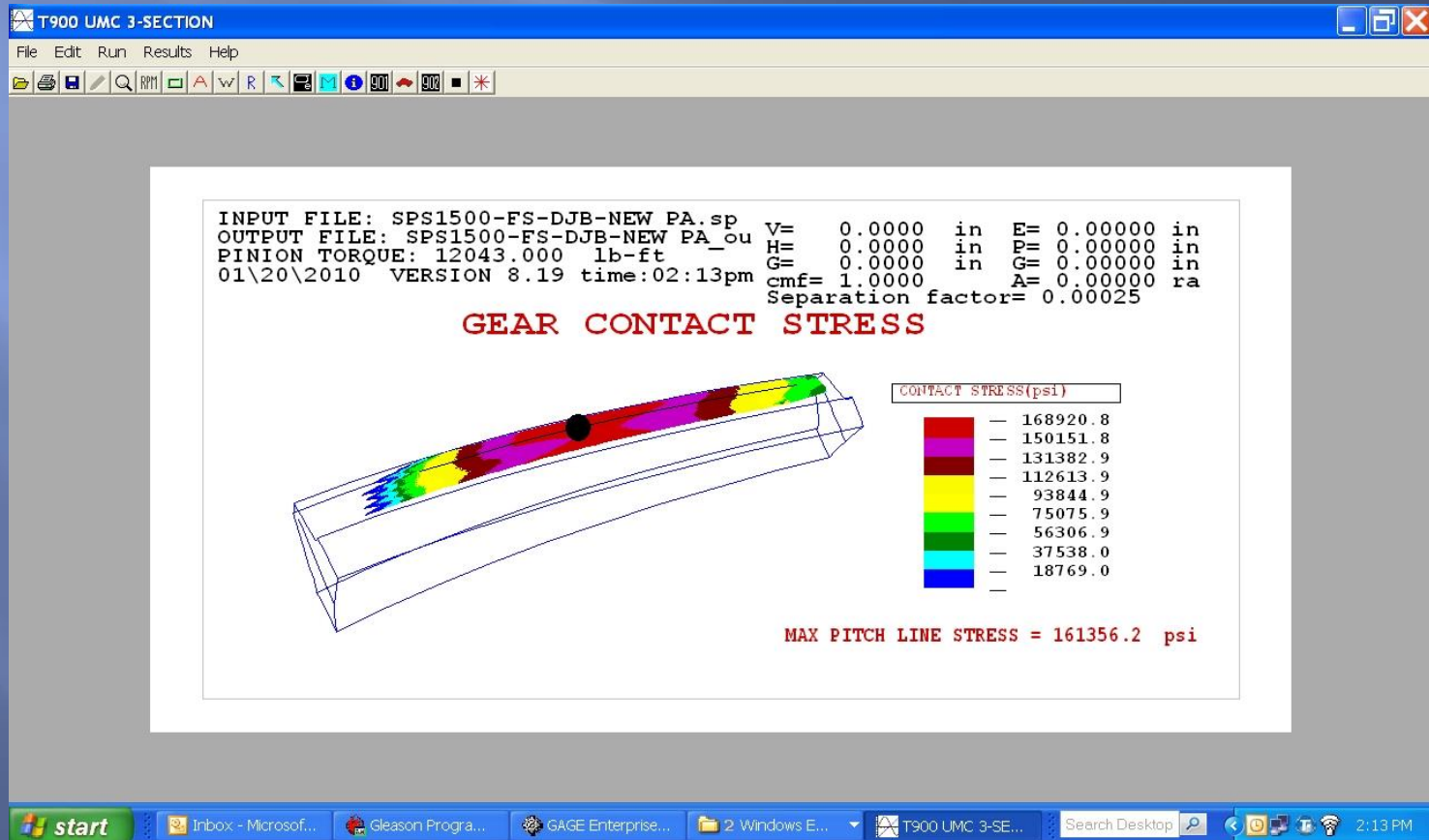


# CFD Flow Analysis



# Gear Design

- Determination of load rating
- Determination of tooth separation forces
- Lifecycle analysis



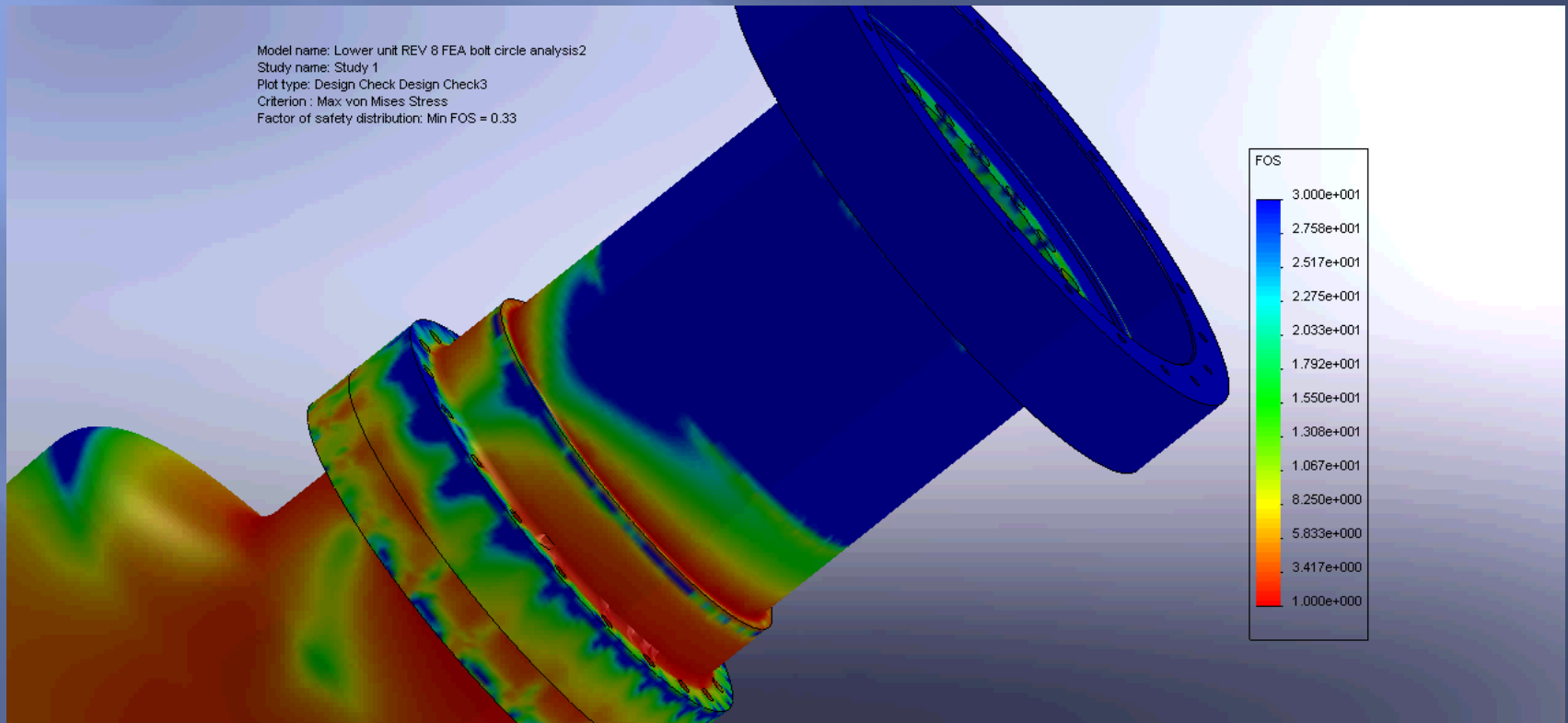
# Bearing Application Engineering

- Determination of load rating from gear data
- Minimum Lifecycle compliance
- Assembly practicality



# Structure and Stress Analysis

- Basic Stress Calculations
- ABS Compliance
- Substantial safety factor
- FEA verification





# Patterns





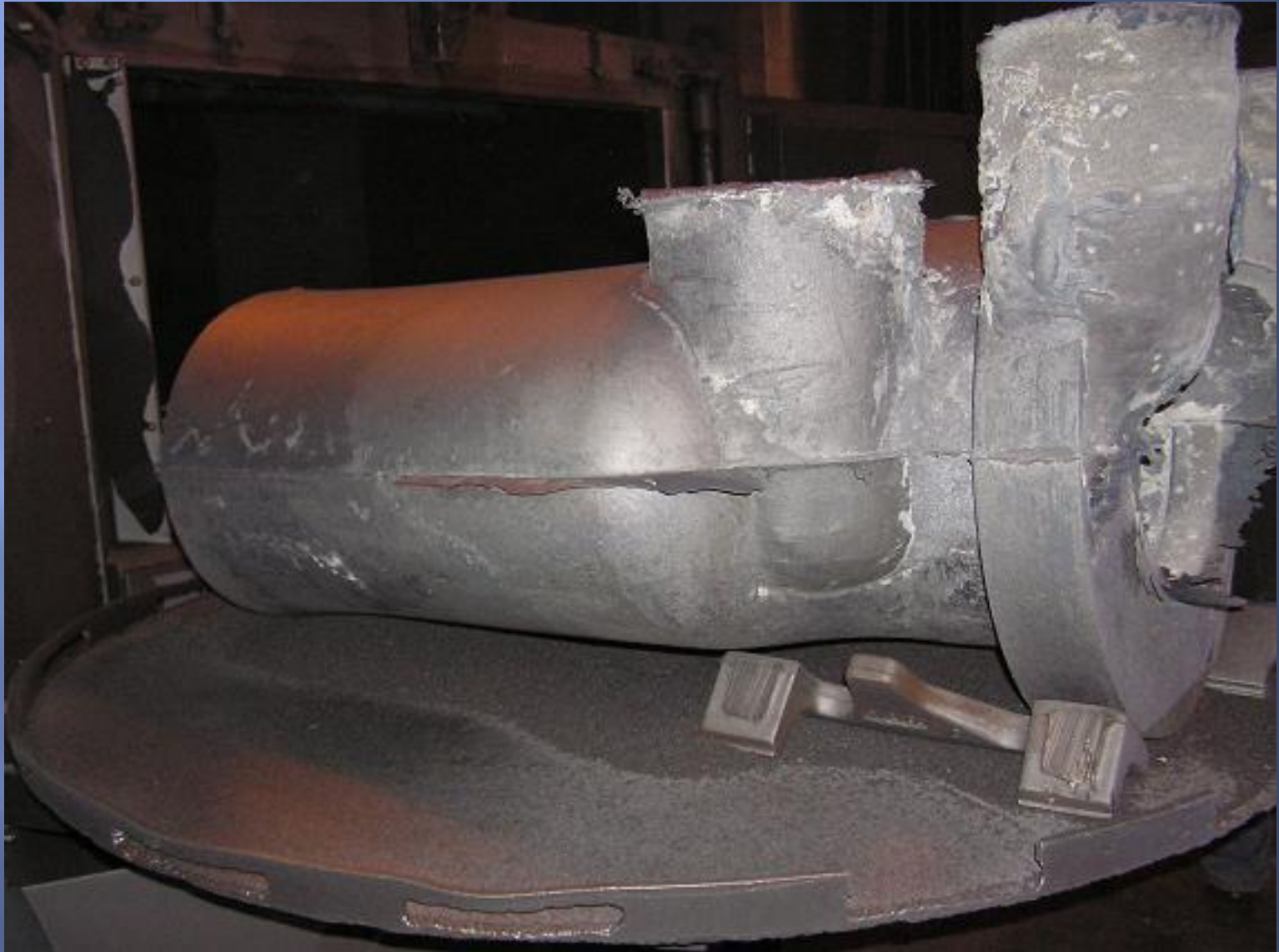


# Casting the Stem





# Stem Casting fresh from the sand



# Aligning the Pod & Stem

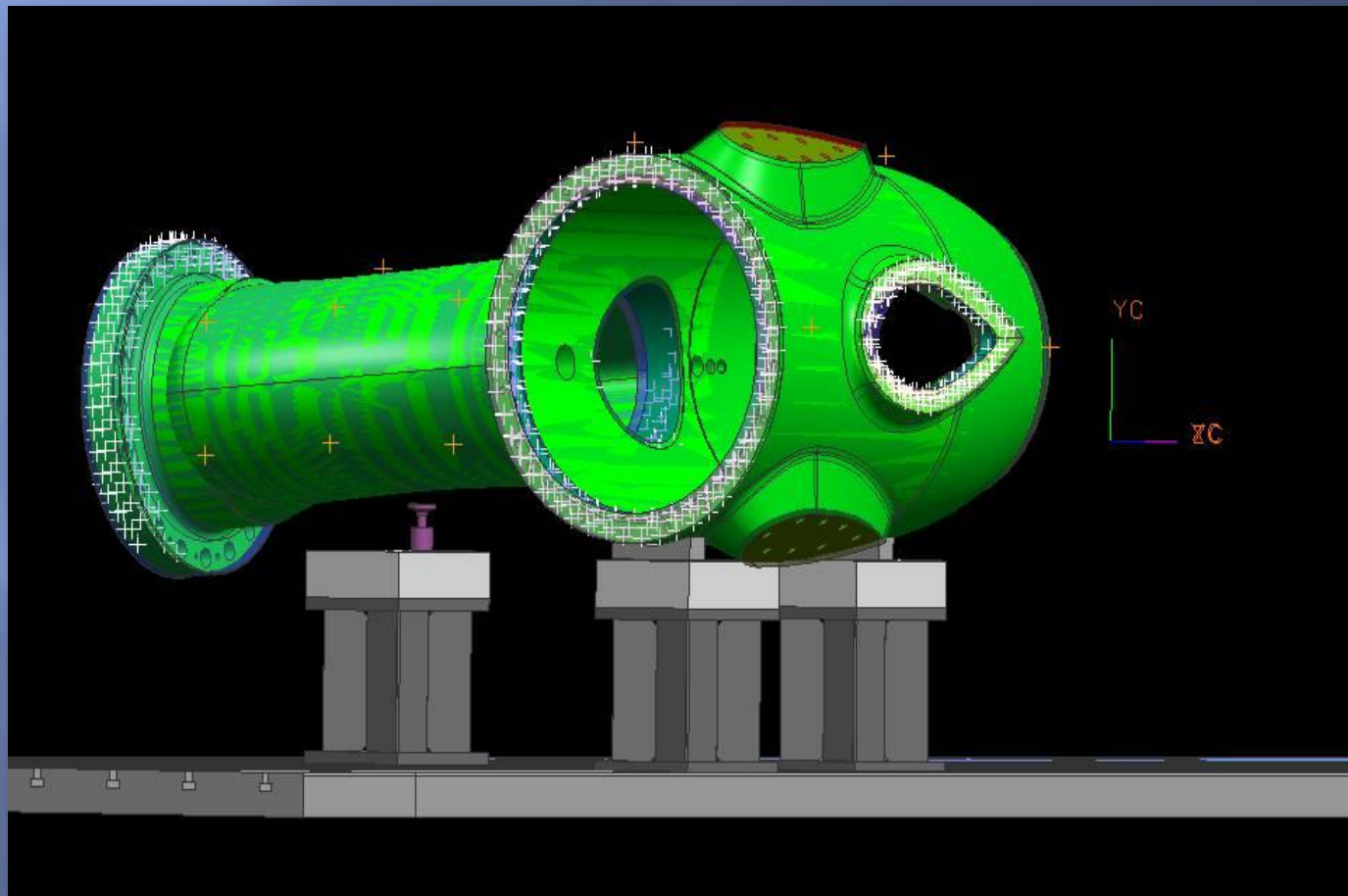


# Pod & Stem ready for final machining





# CNC Machining Layout



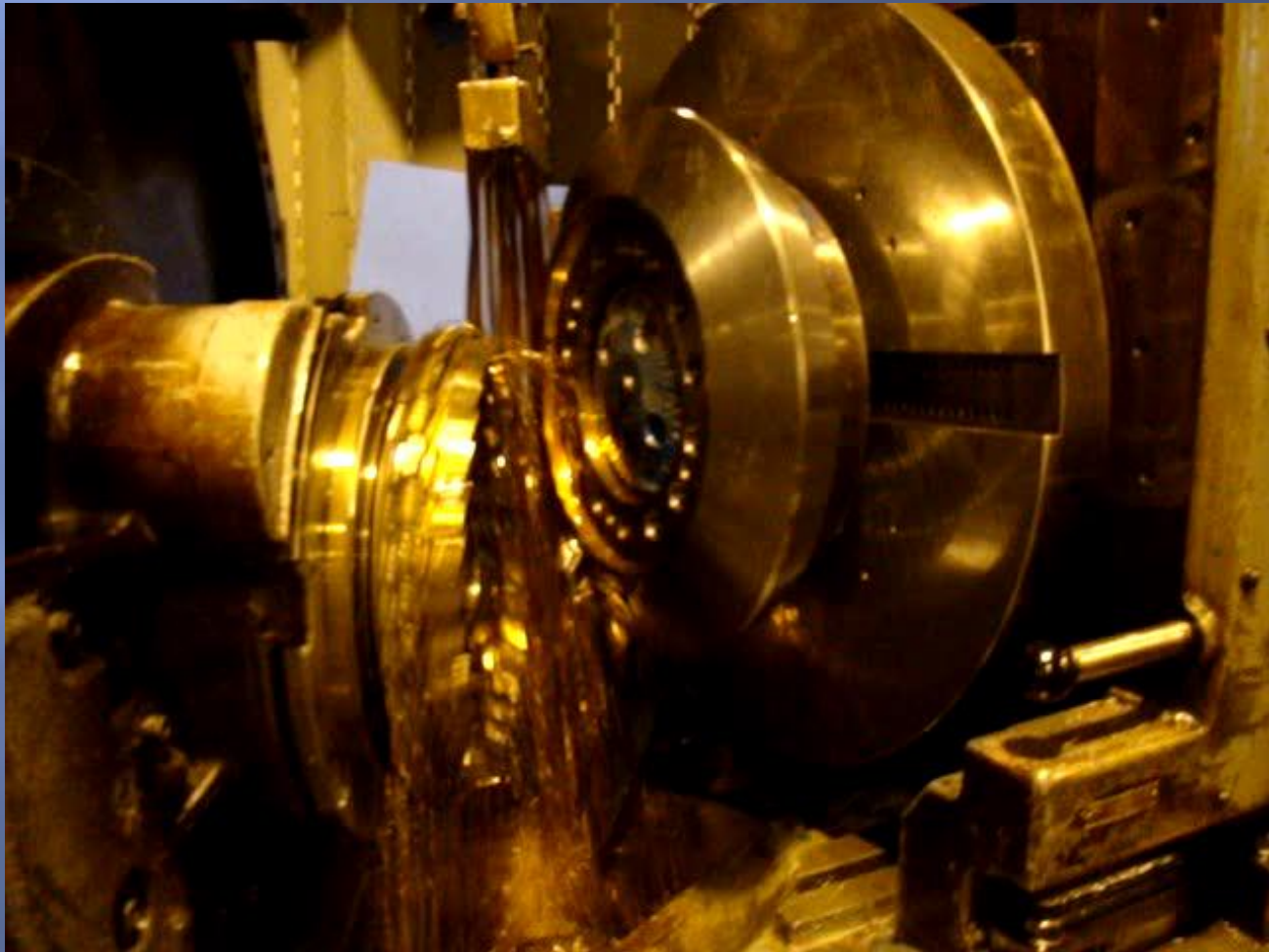




# Lower Ring Gear



# The Gleason Method









# Lower Ring and Pinion ready to assemble



09.20.2010 09:45

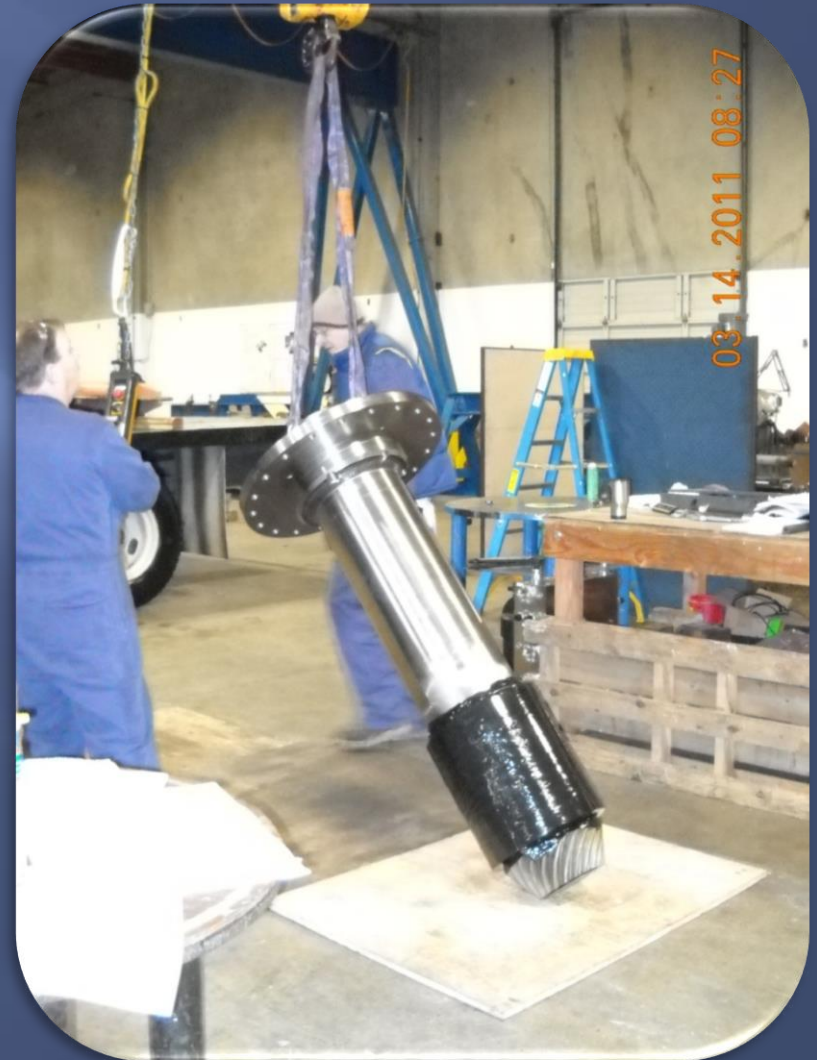
# Bearing Cartridges



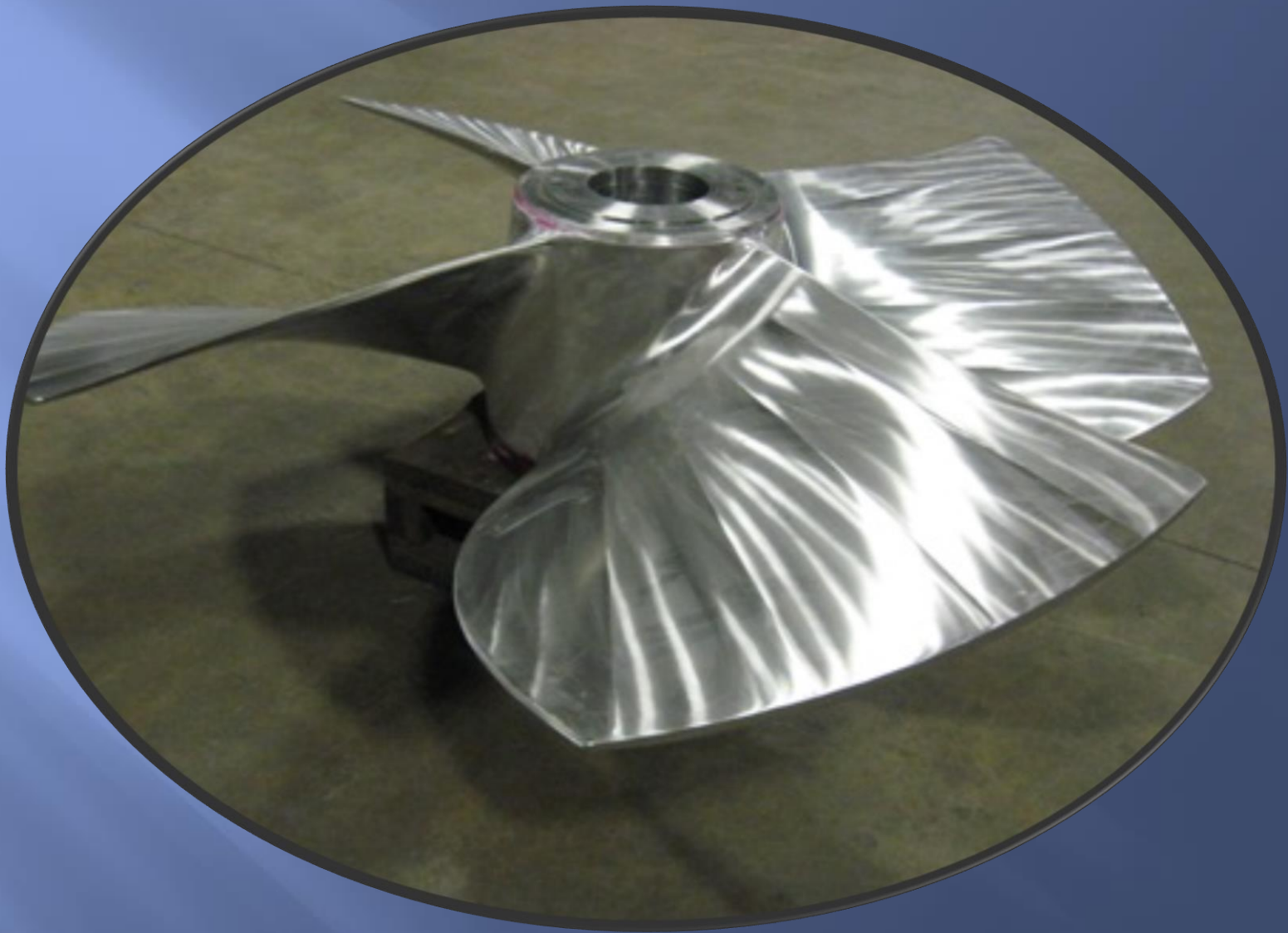




# The Lower Pinion Cartridge







Propeller 77" D 68" P

# Welding Nozzle to Pod





# Assembling the Lower Unit













# Foundation Tub



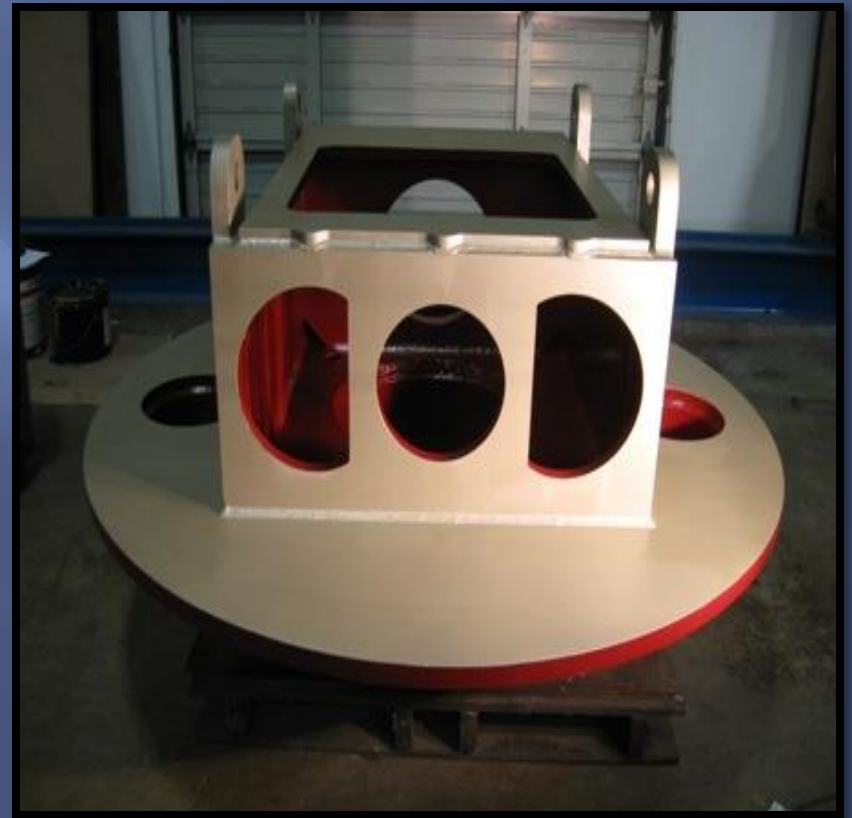
# Assembling the Foundation Tub







# Top Box





# Upper Ring Cartridge



# Assembling the Top Box





# The Assembly/Testing Stand





# Assembling the Main Modules











# The Steering Pinion



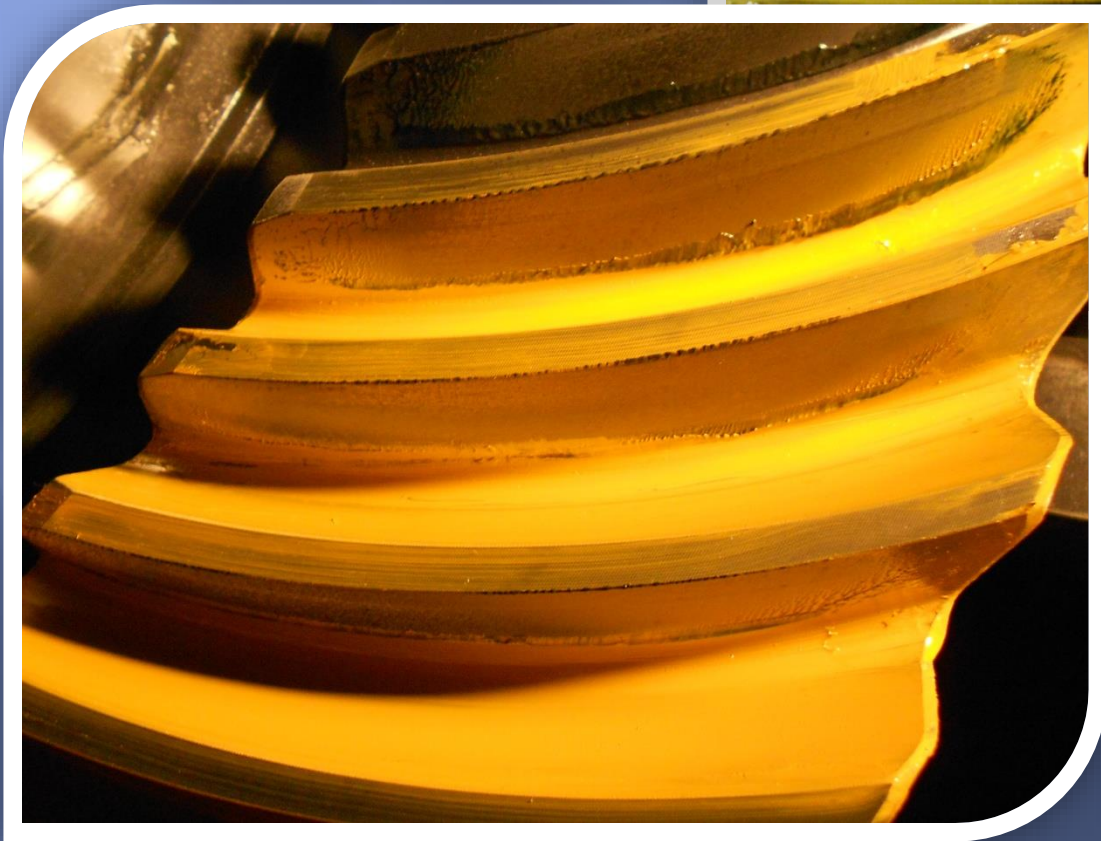


# Load Testing





# Peak Load









# The Top Plate says it all !





Sound Propeller Systems would like to thank the many vendors, associates and advisers that have helped bring this project to fruition.

Many have truly become partners in this project and we thank you for your valuable contributions.

Sincerely,  
Sound Propeller Systems, LLC