



# LYTRON™

iNEMI

Liquid Cooling  
Symposium

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# *Agenda*

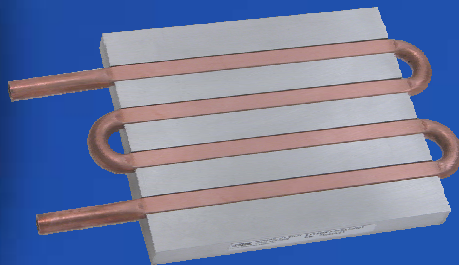
- Background
- Roughness
- Flatness
- Hardness
- Mounting features
- Liquid connections
- **GET VENDOR INVOLVED EARLY**

# *Background*

- **Liquid cooling used in many industries**
  - Power Electronics
  - Medical Lasers and Diagnostic Equipment
  - Military and Aerospace
  - Industrial Lasers
  - Power Generation
  - Cabinet Cooling
  - Analytical Instrumentation
  - Semiconductor Equipment
  - Telecommunications
  - Machine Tools
  - Supercomputers
- **Most of the cold plates are aluminum**
  - Little labor in producing parts
  - Big cost drivers
    - Machining time
    - Additional processing steps



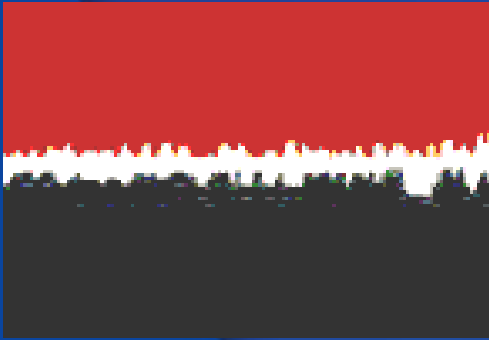
# *Extrusions and Castings*



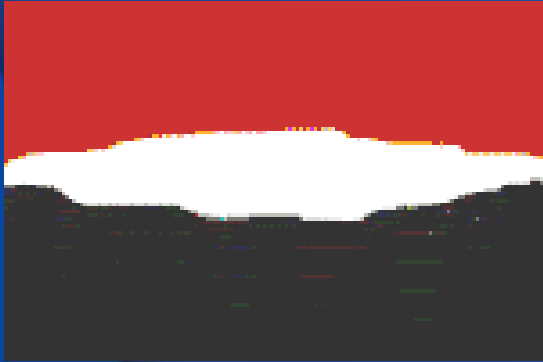
# *Roughness*

**Roughness** - marked by inequalities, ridges, or projections on the surface

- Relatively little impact on thermals
- Typical 32 – 64  $\mu\text{in}$
- Machining limit 16  $\mu\text{in}$
- Below that secondary operation –\$\$\$
- Clamping force can offset roughness



# *Flatness*



- More significant impact than roughness
- Typically 0.001 in/in
- Consider local flatness
- Avoid skim cuts
- Plate surface topography



# *Hardness*



# *Mounting Features aka Holes*

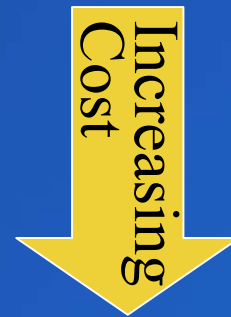
- Big cost driver



Through holes

Tapped holes

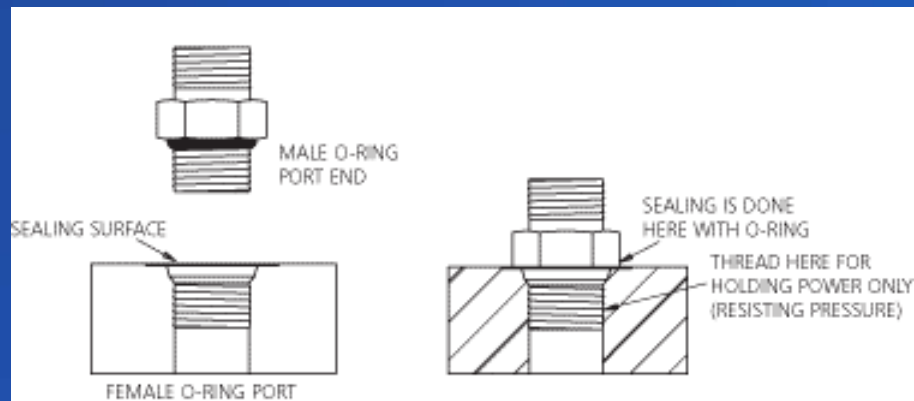
Helicoils



- Avoid small holes

# Liquid Connections

- Recommendation: Straight Thread O-Ring Female Ports
  - Sealed by O-Ring and pressure on top of connector



- Avoid male connectors such as barb or beaded fitting on VB CP
- Quick disconnects can be very expensive



# *Get Vendor involved early*

## **– Avoid costly designs**

- Vendor can provide tips for component placement and board layout**
- Incorporate recommendations such as the ones contained here**