Anter (13)

INNOVATION THROUGH PURSUIT OF ENGINEERING SCIENCE LOGIC

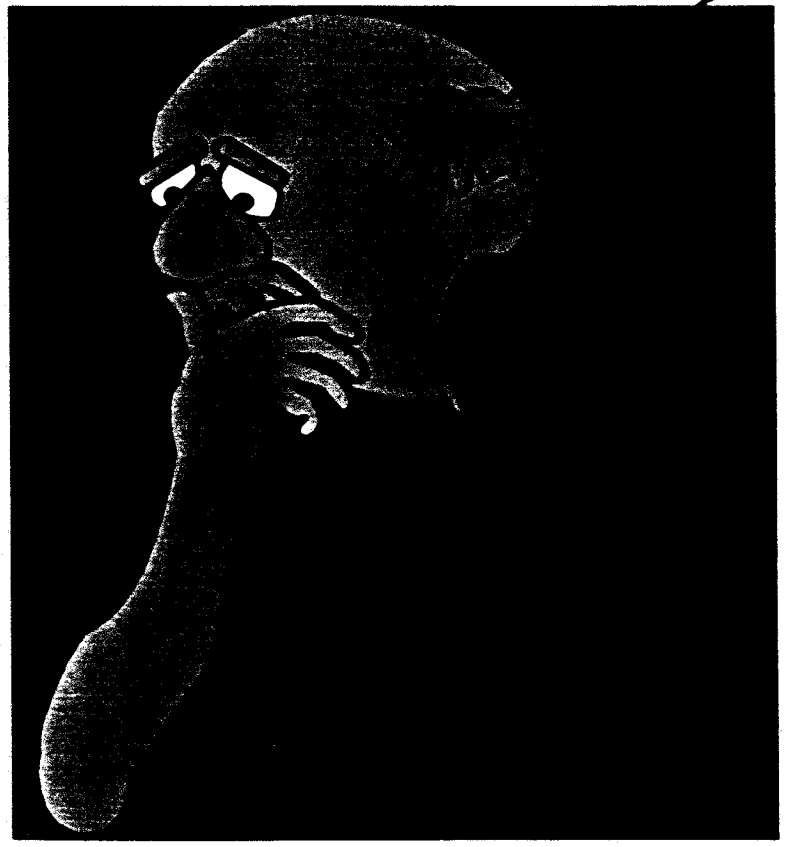
EXAMPLE & APPROACH

WHAT IS THE PROBLEM?

- Need to conduct heat through the structure.
- Establish temperature gradients, leading to thermal stresses.
- Operating temperatures and stresses exceed material limits.
- Limits are reached faster when

k	is lower
alpha	is higher
E	is higher

CAN WE DEAL WITH THIS PROBLEM ?



$E = m\,a^2$

$E = m\,b^2$

$E = mc^2$

Reduce	**E**
Increase	**k**

HOW: Example

SiC-BASED STRUCTURES:

- Use porous SiC, reduce the effective modulus -> more compliant structure.
- Infiltrate with liquid metal, increase the effective thermal conductivity -> reduce temp. drop and thermal stress.
- Other benefits:
  Higher thermal inertia, better thermal fatigue characteristics.

GENERAL APPROACH

- Eliminate large temp. drops across solid walls by enhancing conduction and reducing stiffness.

- Minimize the need to conduct heat through solid walls by creating efficient alternate or complimentary heat transport paths (flowing films).

- Reduce film temperature drop in coolant, e.g., by adding particulates to gaseous coolants.

- Transporting heat at nearly fixed temperature, e.g., by relying on phase changes or using high heat capacity coolants.

Other ideas are invited here.