

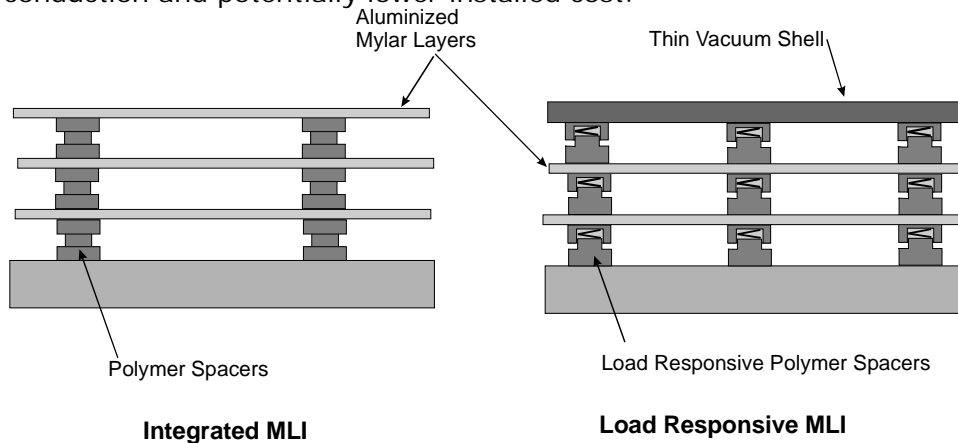
06/2009- Quest Presents “Integrated and Load Responsive Multilayer Insulation”

Quest Principal Investigator Scott Dye, along with co-authors Alan Kopelove (Quest) and Gary Mills (Ball Aerospace) presented a paper at the 2009 Cryogenic Engineering Conference, “Integrated and Load Responsive Multilayer Insulation”.

Abstract:

Multilayer insulation (MLI) is used to reduce heat leak into cryogenic systems such as tanks, dewars and instruments, and used to control spacecraft heat leak. MLI is typically used in a high vacuum ($<10^{-3}$ Pa) where its performance usually exceeds other insulations by 10-fold. Conventional MLI consists of layers of low thermal emissivity metalized polymer sheets separated by low conductance netting spacers.

We report on an improved MLI in which the spacer netting is replaced by micro-molded polymer parts with low thermal conductance. Integrated MLI (IMLI) is a precisely engineered insulation system with advantages over conventional MLI, including higher and more predictable performance, lower particulate contamination, optional electrical conduction and potentially lower installed cost.



A second novel insulation, Load Responsive MLI (LRMLI) is described which uses polymer spacers that dynamically respond to load, compressing to support the external load of a vacuum shell in one atmosphere, and decompressing under reduced atmospheric pressure for lower heat leak.

Structural and thermal analysis and testing results are presented. IMLI and LRMLI performance are compared to conventional MLI and polymer spray on foam insulation (SOFI).

A poster paper was presented at the Conference, and a paper published (*Advances in Cryogenic Engineering*, Vol 55, pp 946 – 953, 2010, Transactions of the Cryogenics Engineering Conference 2009).