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## Vacuum Training Syllabus

(Four hour vacuum training with focus on cryopumping systems).

Section 1 – Basic Vacuum Technology – origins of term ‘torr’; brief history of vacuum pump evolution; introduction to gas laws; stages of vacuum – roughing pumps, high vacuum pumps.

(how oil-sealed rotary vane pumps, dry scroll pumps, dry roughing pumps – diffusion pumps, turbomolecular pumps and cryopumps operate, advantages and applications that are typical for each).

*The objective is to understand the concepts of achieving various levels of vacuum, the basic physics involved and the roles of different types of pumps.*

Section 2 – Helium Closed Cycle Refrigeration Systems – history of the development of ‘cryogenic’ vacuum pumps (liquid cryogen, closed cycle refrigerators); operation of closed-cycle helium refrigeration systems – how a cryopump works, how a compressor works, measuring temperature, regeneration cycles, maintenance of cryogenic systems; rebuild of vacuum side of customer cryopump – remove and replace the charcoal array.

*The objective is to understand how closed cycle helium refrigeration systems operate, how each component works, maintenance required, replacement of vacuum side charcoal array.*

Requirements:

The course is powerpoint based requiring a conference room with overhead projector plus a white board or paper easel with markers.

The course runs for approximately four hours typically starting at 09:00 with break for lunch at 11:30 hrs. recommencing for completion and cryopump vacuum side rebuild.