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CRYOPUMP OPERATIONS AND RELIABILITY

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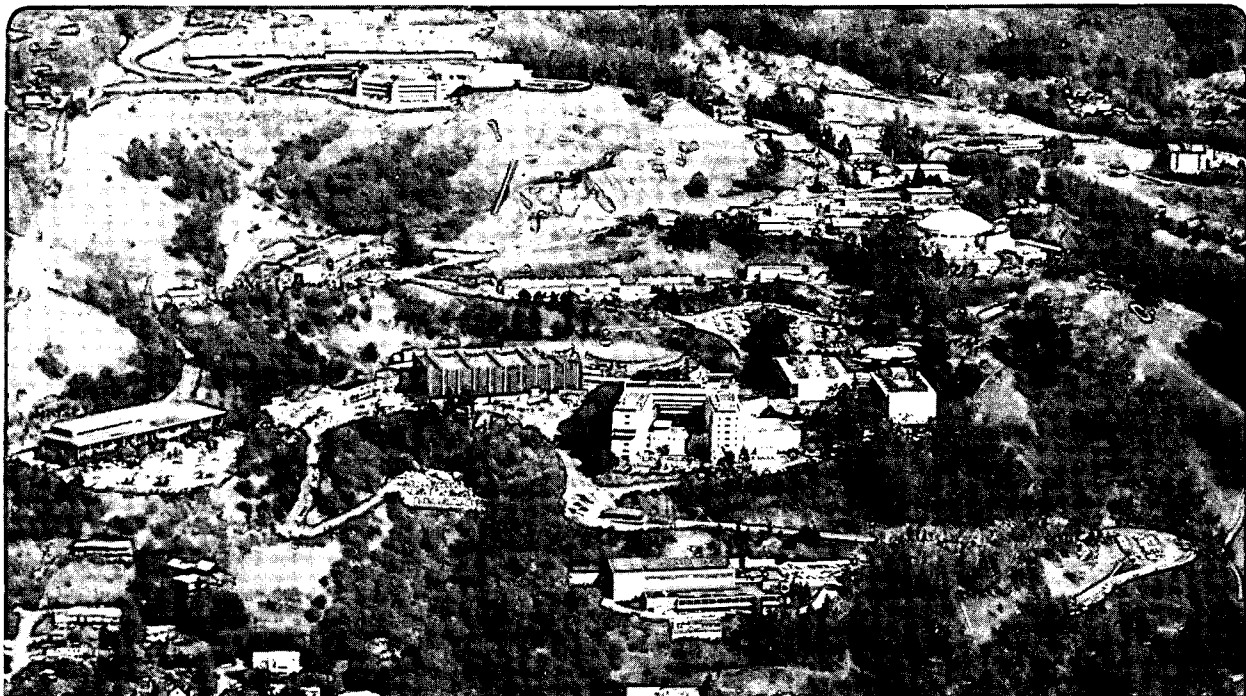
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LAWRENCE RADIATION LABORATORY - UNIVERSITY OF CALIFORNIA		CODE	SERIAL	PAGE
ENGINEERING NOTE		BW2007	M4683	1 OF 2
AUTHOR	DEPARTMENT	LOCATION	DATE	
R. Byrns	Mechanical Engineering	Berkeley	April 23, 1974	
PROGRAM — PROJECT — JOB				
BEVATRON				
VACUUM PUMPING SYSTEM				
TITLE				
CRYOPUMP OPERATIONS AND RELIABILITY				

SUMMARY:

R. Aita and E. DeMartile have now shown that the Bevatron Helium Refrigerators (20°K) can give long-term (8+ weeks) continuous operation. The primary problem is p.p.m. (parts per 10⁶) sanitation and proper cleansing of the charcoal traps. (See E.N. M4647)

DISCUSSION:

Both Bev. He. Referers were cleaned up before January 4 by circulating hot (~150°F) He gas to the refer and back through an LN charcoal trap with diaphragm compressors. The LN external trap plugged often and liquid was blown out on warm-up. Further treatment was multiple pump/purge (25+ times) (January rate-of-rise: 95μ in 5 min., April: ~35μ in 5 min.). Problems in reactivating the East Refer arose from diaphragm compressor mal-function, and the clean-up was apparently incomplete in January. The West Refer ran 8 weeks fault free from January 4 to February 28 (shutdown). The East iced up in one week but was kept operational with LN added.

The major problem has been the last charcoal trap in the He refer, with no simple method of clean-up or by-pass, and continual contaminant release to the valves (M4647, part III). Strobbridge (NBS-CEL) describes this as "the contaminant front moving through the charcoal bed".

Cure techniques listed in decreasing importance:

1. Circulate hot He in and out to LN purifier.
2. Multipump and purge (30+ times) to successively lower pressures.
3. He purge when opening expander cylinders to air.
4. Pump/purge for He bottle change.
5. Helium piston seal back-up.
6. Fast warm-up valve.

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Instructions written by R. Aita and DeMartile for expander valve adjustment follow:

CREW INSTRUCTIONS

#1 Exhaust valve iced-up or not seating condition:

- A) Engine inlet temperature 80 psi (27°K) or above.
- B) Engine inlet pressure low (approx. 160 psi or below at 80 psi engine inlet temperature).
- C) Magne-helic 70 in. or above.

To de-ice or reseal #1 exhaust valve:

- 1. Close valve 344 - This isolates refrigerator from helium bottles.
- 2. Rotate #1 exhaust valve only ¼ turn or less at a time (clockwise or counterclockwise).
- 3. After each move, observe magne-helic. If it drops below 50 in. you have cured the problem and engine inlet temperature will soon drop.
- 4. Reopen valve 344.

If above procedure does not work, turn on #2 compressor.

R. Aita - 1/16/74

Distribution:

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