

THE TEVATRON HELIUM LIQUEFIER

Henry Barton

A helium-liquefier plant is being built to supply the liquid helium for cooling the superconducting magnet ring of the Energy Doubler-Saver-Tevatron. The new plant is in an orange prefabricated steel-frame building across Road D from the Main Ring near the downstream end of A Sector. The plant will be the largest helium liquefier in the world, with a capacity of more than 4000  $\ell$  /hr of liquid helium.

The first step in liquefying is to compress the gas to approximately 13 times atmospheric pressure with the two helium compressors. After appropriate filtering, the gas goes into the liquefier.

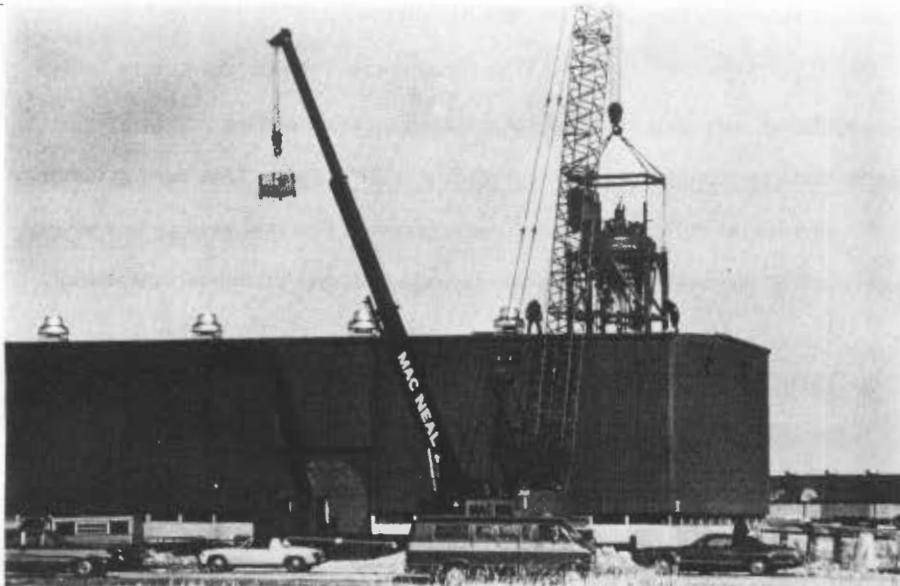
The liquefaction takes place in several steps. First, the gas is cooled to 78 K by liquid nitrogen supplied by the nitrogen reliquefier. It is then cooled further by turbine expanders and flow of cold gas. This cold gas comes from the 85 % of the flow that did not make liquid. The last step is to reduce the pressure of the cold gas as it goes through a Joule-Thompson throttling valve.

A gas-liquid mixture emerges from the liquefier and is separated into liquid (15%) and gas phases (85%) in a vessel located near the liquefier cold box. The liquid portion is used to cool ring magnets and the cold gas is sent back through the liquefier unit so that it can cool the incoming warm stream of high-pressure gas. The devices which do this cooling are counterflow heat exchangers and form the heart of the liquefier. By the time the low-pressure gas emerges from the top of the liquefier, it has been warmed to nearly room

temperature and is sent back to the compressors to be compressed again, in what is, in fact, a closed cycle.

The main liquefier portion of the plant was delivered in April and installed through panels in the roof by two cranes, as is shown in the accompanying photo. The compressors are 4000 hp units acquired as surplus from a liquid-oxygen plant in California and reconditioned and modified for helium service.

At this time, final piping and control assembly and check-out are in progress. The plant is expected to be in operation by this fall.



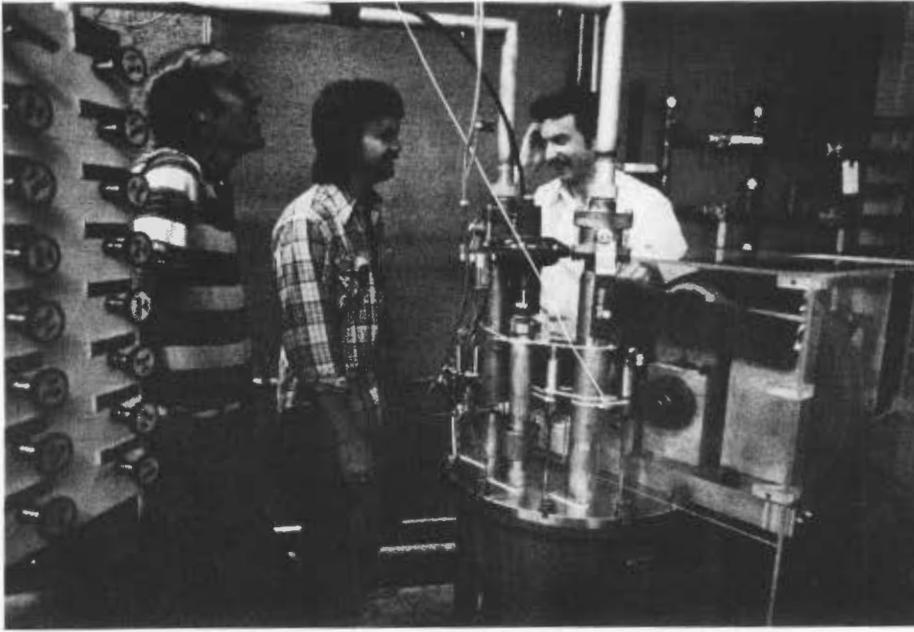
Installation of the Helium Liquefier.

(Photograph by Fermilab Photo Unit)



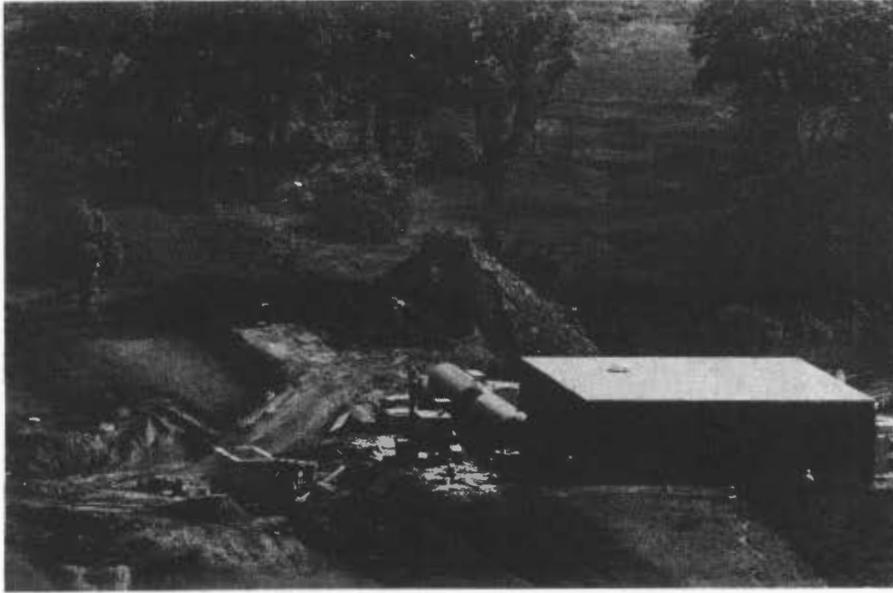
The magnet of the old University of Chicago cyclotron is mounted in the Village near Batavia Road as an historical exhibit.

(Photograph by Fermilab Photo Unit)



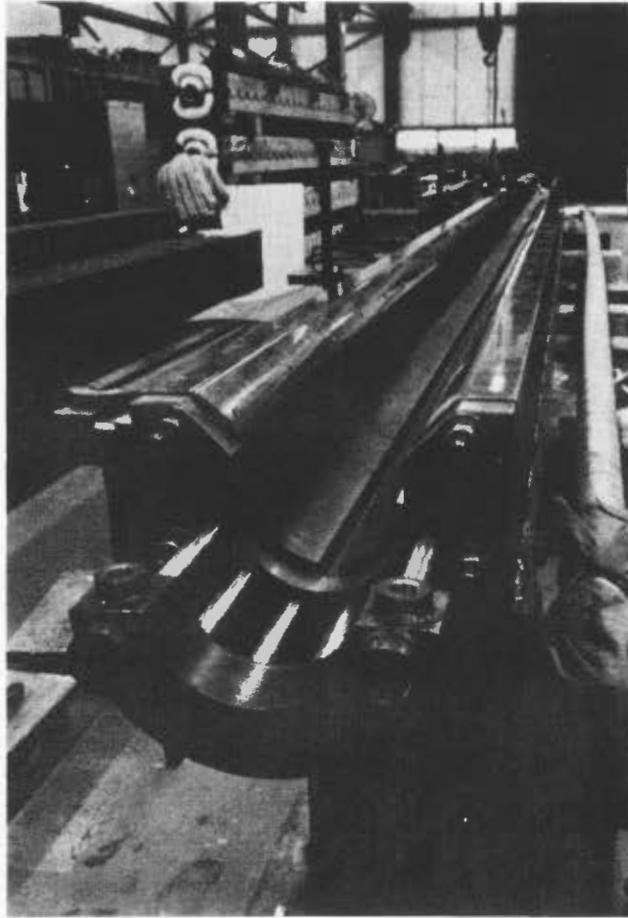
Dick Andrews, Jack McCarthy, and Jeff Appel (left to right) discussing the operation of the gas expansion engine seen in the foreground. The equipment is part of the liquid helium satellite refrigerator system being prepared for use in the Switchyard.

(Photograph by Fermilab Photo Unit)



A view from the 15th floor of the Central Laboratory of the construction work going on at the Switchyard Service Building in connection with installation of superconducting magnets in the Switchyard.

(Photograph by Fermilab Photo Unit)



Laminated tooling built for use in making Energy Doubler/Saver magnets.  
(Photograph by Fermilab Photo Unit)

NOTES AND ANNOUNCEMENTS

PHOTON WORKSHOP AT FERMILAB. . . .

A four-day Photon Workshop will be held at Fermilab on August 1 through August 4, 1978. The workshop should bring together those people who have an interest in pursuing research in high-energy photon beams. Results from the present Fermilab photon experiments will be reviewed and reports on the programs at other laboratories will be presented.

Opportunities for upgrading old facilities and for building new ones will be discussed with particular emphasis on photon physics at Fermilab after 1 TeV becomes available.

Those who are interested in attending may write or call the workshop secretary, Pat Mascione, Central Laboratory 14th floor, Ext. 4462.

FERMILAB RESEARCH PROGRAM WORKBOOK AVAILABLE. . . .

A limited number of copies of the 1978 Fermilab Research Program Workbook are available from the Program Planning Office on a first-come first-served basis. The price of the Workbook is \$5.00, which may be enclosed with a request or charged to an active account at the Laboratory. The material in the Workbook has been prepared for the annual review of the Fermilab research program at the summer meeting of the Physics Advisory Committee. The information contained in it may be useful to individuals with a general interest in research at Fermilab or those in need of a reference to the many Fermilab research proposals.