

D0 Collider Detector

LINDE,
EAST CHICAGO
(LAr Contractor)
TRIP REPORT

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Lindetrip to East Chicago, 3/22/90

K. Dixon, K. Krempetz, G. T. Mulholland, and J. Urbin visited Lynn Busby, Margaret McDermott, and others (briefly) to understand the Air Plant, and, especially, the LAr aspects of their operation.

The East Chicago plant was built in 1972, and is one of three nearby Linde Air separation plants. The others are Burns Harbor and Gary Lakeside. Gary Lakeside is scheduled for retirement soon.

East Chicago is capable of processing air at a 6-7E6 SCFH rate. They can produce as much as 1.2E6 SCFH O₂ and 4.5 SCFH N₂ (not coincidentally) with a peak product efficiency of 85-86% (product to total intake). The general area demand has been as high as 10E6, as low as 4.5E6, and is currently 8E6 SCFH total product.

The plant is really four plants in one. At any one time one or more plants can be down for maintenance and the others online and delivering to the pipe line that distributes their product to nearby steel plants, and to the liquid reservoirs (perlite insulated tanks) of 160, 160 and 200 E6 SCF. At the time of our visit two plants were down and two were on line. The following describes the characteristics of one of the four plants.

The cycle requires a base compressor (Brown Boveri, 22,500 hp) that pumps to 90-100 psig, and a booster compressor (Clark, 14,000 hp) that pumps to 300 psig. Filter houses (ca. 20'X20') feed the suctions and the discharge is scrubbed by dual, molecular sieve, beds @ 300 psi (6-8 hour cycle time). The beds are provided with dust blow down and down stream filter provisions. The scrubbers remove CO₂, the heavy HC, and water. The effectiveness of the scrubbers is measured by the record 6 years one of the plants ran w/o the need for thawing. The thaw operation takes about 4 days. It was interesting to learn that a plant can be brought on line in two and one half hours from a warm start. Major swings from N₂ rich to O₂ rich production take about an hour.

Argon is a small constituent in air (0.6%) and thus not a major product. It comes off the main column at 75% Ar balance air components and is further purified in another column to 2% N₂, 2% O₂. The stream is then warmed, H₂ added, and run through a palladium deoxo to combine the O₂ to water. The water is removed in a dryer and the product reliquified to separate the nitrogen. The final product is either drawn off and pumped to storage, or, in the case of case of the high purity product, pressure transferred directly from the final column to a properly cooled and purged truck backed right up to the column. The high purity product can be as low as 0.3 ppm O₂ by proper application of these procedures.

Liquid Argon is the only product for which standing, loaded, trailers are provided vent recovery lines. The recovered gas is fed back to the crude Ar stream.

The local O₂ monitoring equipment is a Teledyne 306WA with ranges of 1, 10, 100 and 1000 PPM full scale. The wet cell unit is available from ENPRO for an estimated \$3,500. The N₂ in Ar is measured by a special in-house Linde instrument. Our further high purity measurement questions were directed to,

Linde Specialty Gases
East Chicago
Rich Dlugosz
(219) 398-0800

and

Linde 0 Tonawanda, N.Y.
Analytical Labs
Jim Borkman
(716) 879-2494

The moisture was measured by a MEECO "W" unit (CHL has one).

The guaranteed level of O2 in the standard product Linde delivers to its customers is 4 ppm.

We asked for and received a schematic for the LAr trailers as a result of our tour of the LN2/LO2 truck fill station. All the trailers we saw had CGA fittings at the delivery end (and either 12 or 14' hoses). Each trailer had a 4 bolt, 150 psig, SS, flange immediately upstream of the CGA fitting. The LAr trailers had the same arrangement. That means we can provide our own hose (tight and ready to go) welded at our piping, and fitted with a four bolt flange at the other end. It is much easier to make up a four bolt flange tight with "Durabola" gasket material than make up the standard CGA fitting (with white teflon seals from Malbrath in Chicago, their standard). After verifying the details of this situation (for all trucks, all the same flange, and etc.) I expect DO will make their own off-load hose, as described. The trailer expert (Frank Moore) was not on site at the time of our visit, but can be reached through Margaret McDermott.

The visitors were especially well received and treated very pleasantly. We offered to reciprocate when the Linde people might be interested to visit Fermilab. We were pleasantly surprised to hear that many of them had driven the hour and a half to take the Fermilab, 15th floor, self-guided-tour.

END