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INTERIM NORMAL LIMITS DR REACTOR

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PRELIMINARY REPORT

This report was prepared only for use within General Electric Company in the course of work under Atomic Energy Commission Contract AT(45-1)-1350. Any views or opinions expressed in the report are those of the author only.

This document consists of
6 pages, [REDACTED]

February 10, 1964

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INTERIM NORMAL LIMITS
DR REACTOR

by
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Process Engineering Unit
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INTERIM NORMAL LIMITS
DR REACTOR

- Ref: 1. Baars, R.E., PITA IP-26-I, Transition to High CO₂ Concentrations and Revision of Gas Purity Limits and Controls, HW-79281, October 17, 1963, (Secret).
2. Letter, D. K. George to E. J. Filip, Air Entry Control Tests - DR Reactor, November 8, 1963.
3. George, D.K., to E.J. Filip, Results of Air Entry Control Test #1 - DR Reactor, HW-80836, February 10, 1964, (Unclassified).

PURPOSE

As specified in PITA IP-26-I (reference 1), a test has been conducted at DR reactor to find the amount of nonpressure sensitive air entering the reactor, and gain other information on the reactor gas system (reference 2). The purpose of this document is to place in effect interim normal gas purity limits and define assuredly positive gas system pressure based on the results of this test (reference 3).

NORMAL LIMITS

A. Nitrogen Concentration

The normal limit for nitrogen concentration in the reactor gas shall be as shown on Figure 1 for the previous days total gas loss. This limit does not apply during the reactor startup transient period.

- B. The normal limit for gas activity at the outlet shall be as shown on Figure 2 for the previous days total gas loss. This limit does not apply during the reactor startup transient period. The gas activity meter is to be used as a backup instrument to the gas chromatograph.

- C. Oxygen concentration - 0.02 per cent.

OVERLIMITS PROVISION

Following the startup N₂ transient, observe the following requirements when over the normal limit:

- A. Within 30 minutes after exceeding the normal limit, raise controlled gas pressure by 0.05 inches of water. Continue raising pressure by 0.05 inches of water at 30-minute intervals until a downward trend of N₂ is established or until pressure has been raised 0.15 inches of water. If a decreasing trend in N₂ is not established by raising pressure a total of 0.15 inches of water, further pressure raises are optional. The pressure which establishes a downward trend shall be maintained until the N₂ is within the normal limit.

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- B. If pressure increases do not establish a downward N_2 trend after a minimum raise of 0.15 inches of water, hold that pressure and check O_2 concentration. If the O_2 concentration is above 0.02 per cent and cannot be brought below 0.02 per cent by some corrective action within 24 hours, shut the reactor down.
- C. If the O_2 concentration exceeds one per cent and remains above one per cent for 30 minutes, shut down the reactor at once.

Deviation from these limits must be approved jointly by the Manager, DR Processing Operation, and the Manager, Process Technology. Approval may be verbal, but must be subsequently documented.

STARTUP LIMITS

- A. Maintain assuredly positive pressure from startup until the normal limit is met. Assuredly positive pressure is defined as a minimum of 0.08 inches of water, or 2-2/3 minor divisions above the null point on the circular differential pressure recorder chart in the control room. This pressure presently corresponds to a reading of 36.0 on this recorder. Both the inlet and exit differential pressures must be maintained above this pressure.
- B. The normal O_2 limit (0.02 per cent) shall be met within ten hours after the maximum graphite temperature has reached 400 C.

EFFECTIVE DATE

These limits shall become effective on approval of this document. After approval of this document, assuredly positive pressure will be maintained until the normal limit is met.

BASIS

A. Normal Limits

PITA IP-26-I (reference 1) defines the interim normal N_2 limit as the higher of:

1. 120 per cent of the N_2 concentration corresponding to the nonpressure dependent entry rate, or
2. This N_2 concentration plus 0.1 per cent.

The results of air entry control test #1 (reference 3) show a nonpressure dependent air entry rate of about 45 cubic feet per day or an N_2 entry rate of about 35 cfd. At less than 7000 cfd total gas loss, 120 per cent of the N_2 concentration resulting from this entry rate (1 above) leads to a higher limit than this N_2 concentration plus 0.1 (2 above). Therefore, the normal limit is 120 per cent of this N_2 concentration at a 7000 cfd gas loss or less. At a gas loss of greater than 7000 cfd, the normal limit is this N_2 concentration plus 0.1 per cent. Figure 2, the normal

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exit gas activity limit was found from Figure 1, and the gas activity meter calibration curve given in the results of Air Entry Control Test #1 (reference 3).

B. Assuredly Positive Pressure

Assuredly positive pressure is defined in PITA IP-26-I (reference 1) as the pressure that will exclude pressure dependent air entry to the reactor. This pressure was found in Air Entry Control Test #1 to be 0.08 inches of water. In Air Entry Control Test #1, the front differential, which was not controlled, varied from 0.06 inches of water below to 0.20 inches of water above the exit differential, which was controlled (reference 3). Because of this variation, a controller setting cannot assure positive pressure. The differential that is not controlled should be periodically checked during the startup period to assure that it is positive.

C. The overlimits provisions are as specified in PITA IP-26-I.

PURITY BASED STARTUP TRANSIENT LIMIT

Air Entry Control Test #1 was written to investigate the use of a purity based startup transient limit. The apparent DR gas system volume was found in test #1 to be higher than expected (reference 3). This fact and the low daily gas loss will result in a startup transient period so long that a purity based limit does not appear feasible at this time. Test #1 data will be collected however to further explore this method of control.

DK George:md

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