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Gaseous helium utilization for helium bags

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GASEOUS HELIUM UTILIZATION FOR HELIUM BAGS

H.J. Thomas

Usage

Helium is used by experimenters in helium bags which are located in the secondary beam locations where the geometrical considerations or time element preclude the use of vacuum pipe or boxes. The bags are generally constructed of 8 mil polyethylene and 1 to 3 mil mylar is used for front and rear windows.

Helium permeability through the wall is estimated for bags made of the following materials:

Mylar	.06 CF/sq yd/24 hr	1 mil thickness
Polyethylene	.4 CF/sq yd/24 hr	8 mil thickness

The total surface area of helium bag in use at the present time is approximately 50 sq yds. At the above permeability the loss through a perfectly fabricated bag is 20 CF/24 hr or 7200 CF/yr.

At a cost of 6 cents/CF, the total charge per year for helium in bags, not counting purging operations, would amount to $500. It is acknowledgedly very difficult to construct a perfectly leak tight bag, however, when a good bag is fabricated the losses can be limited to 1 CF/hr/sq yd the helium use (50 sq yds of surface) @ 1 CF/hr/sq yd would amount to approximately 360,000 CF of helium/yr at a cost of $22,000. (See Table I).

Some experimenters have initiated the practice of bleeding helium bags to dilute any air entrapment that may exist. The flow rates vary from 50 CF/hr to 95 CF/hr with accompanying helium operating costs of between

5000 and 10,000 dollars/month. Table I represents a typical operating condition as of December 2, 1970.

Table II shows bleed rates and cost figures in May 1970 and December 1970 for bags that are bleeding for dilution purposes.

Table III shows an estimate of future utilization based on proposed designs for beams now under construction.

Recommendations

1. Always fabricate bags on a firm clean surface.
2. For the instances where long bags, say - 15 feet in length and larger are required, rigid frames should be used.
3. Operate all bags "non bleed" except for an initial purge at start up.
4. Operate all bags "non bleed" with periodic purging on order of once daily.
5. Install vacuum pipe and vacuum boxes in place of helium bags. Vacuum boxes cost $4000 to $5000 each but are reusable, consequently cost is amortized.

Procurement

Helium used at the AGS is generally obtained from 2 sources. Namely the house system, which is supplied from tube trailers and,cylinder gas that is obtained from central supply. The tube trailers are recharged by Linde and H. Farrel is responsible for these deliveries.

Cylinder gas is ordered for general use by the EAO group through A. Kreisberg or the watch, and all deliveries are signed for by A. Kreisberg or a designee. The experimenters buy gas from their own assigned accounts. There was only one case in the last six months where an experimenter charged gas to 08150. Of course, after the gas is delivered and placed in storage racks,it is available for use by anyone. The only way to eliminate this possibility is to provide a locked storage area accessible to EAO personnel only.

Operations

The EAO group shuts down the supply to bags whenever an experimenter is not running. There have been a few complaints by experimenters, but not significant in number, who were desirous of maintaining continuous bleed.

TABLE I

AVERAGE LEAK DUE TO BLEED AND NON BLEED CONDITION.

PRESENT AS OF DECEMBER 1, 1970

BAGS	AREA SQ.YDS.	RUNNING TIME-HRS.	LEAK RATE CF/HR/SQ.YD.	RT x L.R x A CF/SQ.YD./MO.	BLEED AND NON BLEED CF/MO.	ALL NON BLEED @ 1 CF/HR./SQ.YD.
Beam 4 (455)	12.6	720	1	720	9,100	9,100
Lindenbaum (370)	6.5	300	20	6000	40,000	1,950
G-10 (Beam 5)	2.8	720	1	720	2,000	2,000
Good (375)	4.6	600	20	12000	50,000	1,800
*SUNY (463)	20.	720	1	3600	15,000	15,000
	46.5 Sq.Yds.				116,100 CF/MO.	29,850 CF/MO.

*Normally on Cylinders

$$\text{CF/HR./SQ.YD. Avg.} = \frac{116.000}{46.5 \times 720} = 3.5 \text{ CF/HR/SQ.YD. (Bleed and Non Bleed)}$$

"Bleed and Non Bleed"

Cost @ 116,000 x .06 = $7,000/Mo.

All "Non Bleed" 30,000 x .06 = $1800/Mo.

Note: The "All Non Bleed" condition is not the normal mode of operation.

TABLE II

ESTIMATED HELIUM BLEED RATES

May, 1970

Blieden	16 CF/HR		Bleed
Longo Lindenbaum	51 CF/HR		Bleed
Cronin Kycia	52 CF/HR		Bleed
	120 CF/HR	or	86,000 CF/MO.

@ 6¢/CF - Total Cost/Mo. = $5200/Mo.

December, 1970

Lindenbaum	96 CF/HR		Bleed
Good	95 CF/HR		Bleed
Beam 4	10 CF/HR		Non-Bleed
SUNY	20 CF/HR		Non-Bleed
	221 CF/HR	or	160,000 CF/MO.

@ 6¢/CF - Total Cost/Mo. = $9600/Mo.

TABLE III

AVERAGE LEAK DUE TO BLEED AND NON-BLEED CONDITION FUTURE

BAGS	AREA SQ.YDS.	LEAK RATE CF/HR/SQ.YD.	ESTIMATED RUNNING TIME-HRS.	BLEED & NON BLEED CF/MO. A x L.R. x ERT	ALL NON BLEED @ 1 CF/HR./SQ. YD.
Beam 4 (455)	12.6	1	720	9,100	9,100
Lindenbaum (370)	6.5	20	300	40,000	1,950
G-10 (Beam 5)	2.8	1	720	2,000	2,000
Columbia (478)	40.0	1	300	12,000	12,000
Good (375)	2.8	20	600	50,000	1,800
*SUNY (431)	20.0	1	720	15,000	15,000
Collins (396)	13.0	20	300	78,000	7,800
TOTAL	95.7 Sq. Yds.			206,000 CF/MO.	49,650 CF/MO.

* Normally on Cylinders

"Bleed and Non Bleed"

Cost @ 6¢/CF = $12,400/Mo.

If all are Non Bleed - 50,000 x .06 = $3,000/Mo.

Note: The "All Non Bleed" condition is not the normal mode of operation.

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