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MONSANTO CHEMICAL COMPANY - UNIT III

DAYTON, OHIO

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Laboratory DirectorA STUDY OF THE QUARTZ FIBER BALANCE NO. I

(Information Report)

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PURPOSE

To determine whether temperature fluctuations affect the operation of the Quartz Fiber Microbalance.

METHOD

Three different conditions of the balance were investigated.

1. Balance unprotected from room conditions.
2. Balance protected from room conditions by insulating case.
3. Balance subjected to unbalanced heating (on left side). Sensitive, accurately calibrated thermometers were used to detect the temperature fluctuations.

RESULTS

The results are given in Figures 1, 2, and 3.

CONCLUSIONS

1. Unprotected Balance

- a. The temperature of the room was constant to about $\pm 0.75^{\circ}\text{C}$. However, heat gradients were present with the right side being at a slightly higher temperature than the left side.
- b. Even though the temperature fluctuations were small, the balance followed them in a regular fashion with the rest point shifting upward directly following a temperature rise and vice versa. The amplitude of the weight change curve was about 0.12 micrograms (see Figure 1).

2. Protected Balance

- a. With an insulating case around the balance, the temperature fluctuations were damped out almost completely. Along with this the balance rest point became stable and drifted no more than 0.02 micrograms in two hours (see Figure 2).

— **FIGURE 1** —

TEMPERATURE SENSITIVITY BALANCE #2

BALANCED FLUCTUATIONS

CONDITIONS

- 1) BALANCE IN ROOM AT UNIT #3
- 2) AIR CONDITIONING WIDE OPEN
- 3) NO PROTECTION AROUND BALANCE

— **KEY** — WITH LOAD
 Δ — BALANCE REST POINT
 ○ — TEMPERATURE OF AIR AT RIGHT
 □ — TEMPERATURE OF AIR AT LEFT

FIGURE 2 **TEMPERATURE SENSITIVITY BALANCE #2** **BALANCED FLUCTUATIONS**

CONDITIONS

- 1) BALANCE IN ROOM AT UNIT #3
- 2) AIR CONDITIONING CLOSED
- 3) NU-WOOD INSULATION CASE AROUND BALANCE

KEY

- Δ BALANCE REST POINT WITH LOAD
- $\circ$ TEMPERATURE OF AIR AT RIGHT 73.700
- $\square$ TEMPERATURE OF AIR AT LEFT

— **FIGURE 3** —**TEMPERATURE SENSITIVITY BALANCE #2****UNBALANCED FLUCTUATIONS**

3. Heated Balance

a. Comparing the temperature curves of Figure 3 with those of Figure 1, the rise in temperature of the left side of the balance can be seen. This side was raised in temperature 1 - 1.5°C. above normal.

b. The amplitude of the weight disturbance accompanying the temperature disturbance of only about 1°C. was nearly 1 microgram (see Figure 3).

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