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Back-up Pressurizer Level Measurement Procedure 0800

Pressurizer Heat-up Method

T-5

Purpose: To provide a method to estimate absolute pressurizer level based on the temperature/pressure response of the water in the pressurizer to a known heater power input

Approach: Measure pressurizer temperature and pressure change for a given heater input (No. KW & HRS energized x length of time of test) and calculate pressurizer water volume and level. Spray must be off during test.

Assumptions:

- System nominally at 1000 psig
- Spray off

Procedure Outline

1. With pzr spray secured, record pressurizer water temperature & pressure, total power to heaters and time. Heater power should be as high as practical such that a heat input in the 6000 - 8000 KW-Minutes, minimum, range can be obtained in as short a time as possible.

2. Determine desired length of test = $\frac{\text{Desired heat input}}{\text{Heater power}}$

(E.g., time = $\frac{8000 (\text{KW}\cdot\text{Min})}{\text{Htr pwr in (KW)}}$)

Trend Pzr Pressure, Pzr Temperature, & Pzr Level at 2 min intervals during test.

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3. After the calculated time interval, record pressurizer water temperature; pressure and heater power. Determine Δp and ΔT and Heat input (KW·Minutes).

4. For the applied heat input value, enter Curve 1 with measured Δp and determine approximate level.

5. Determine correction factor from CURVE 2 for metal heat capacity. (Note: Metal heat capacity ~~was~~ becomes important for long time periods and low water levels. Test should be run for as short a duration as possible consistent with achieving a heat input in the 1000 - 3000 KW-MIN range). Correction factor = F.

6. Correct measured Δp by multiplying by F.

$$\Delta p' = F \times \Delta p$$

7. Enter CURVE 1 to obtain corrected level using $\Delta p'$.

Repeat test at three different pressurizer levels

NOTE to correlate data to actual level.

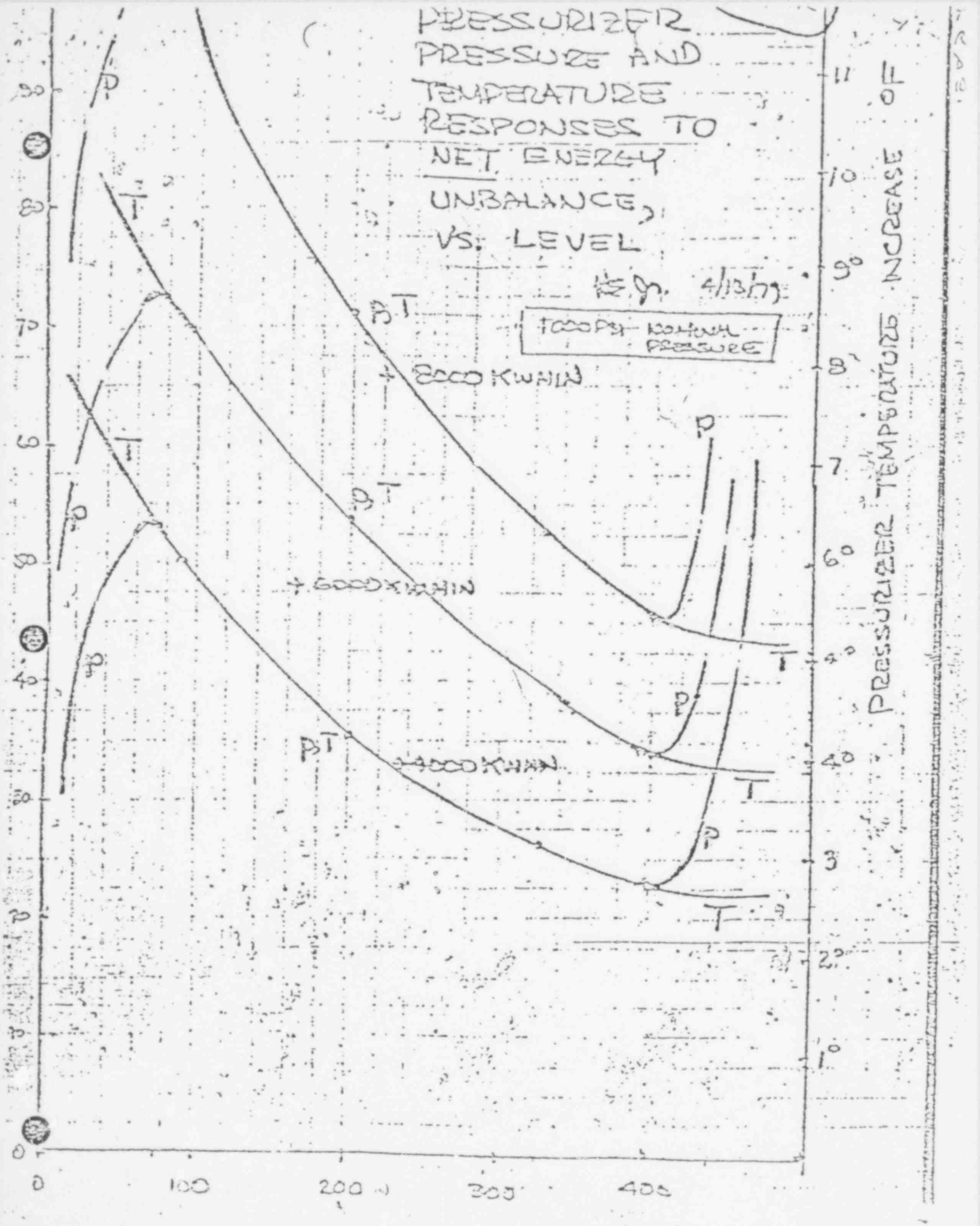
As noted in CURVE 1, Δp and ΔT responses diverge at high levels (~ 400") and very low levels (~ 80"). Therefore, temperature response should be monitored and plotted on CURVE 1 with the pressure response. If both Δp and ΔT do not track together on CURVE 1, it indicates very high or low level

PSO 099

I.e., small Δp and high ΔT ($\Rightarrow$ Low Level

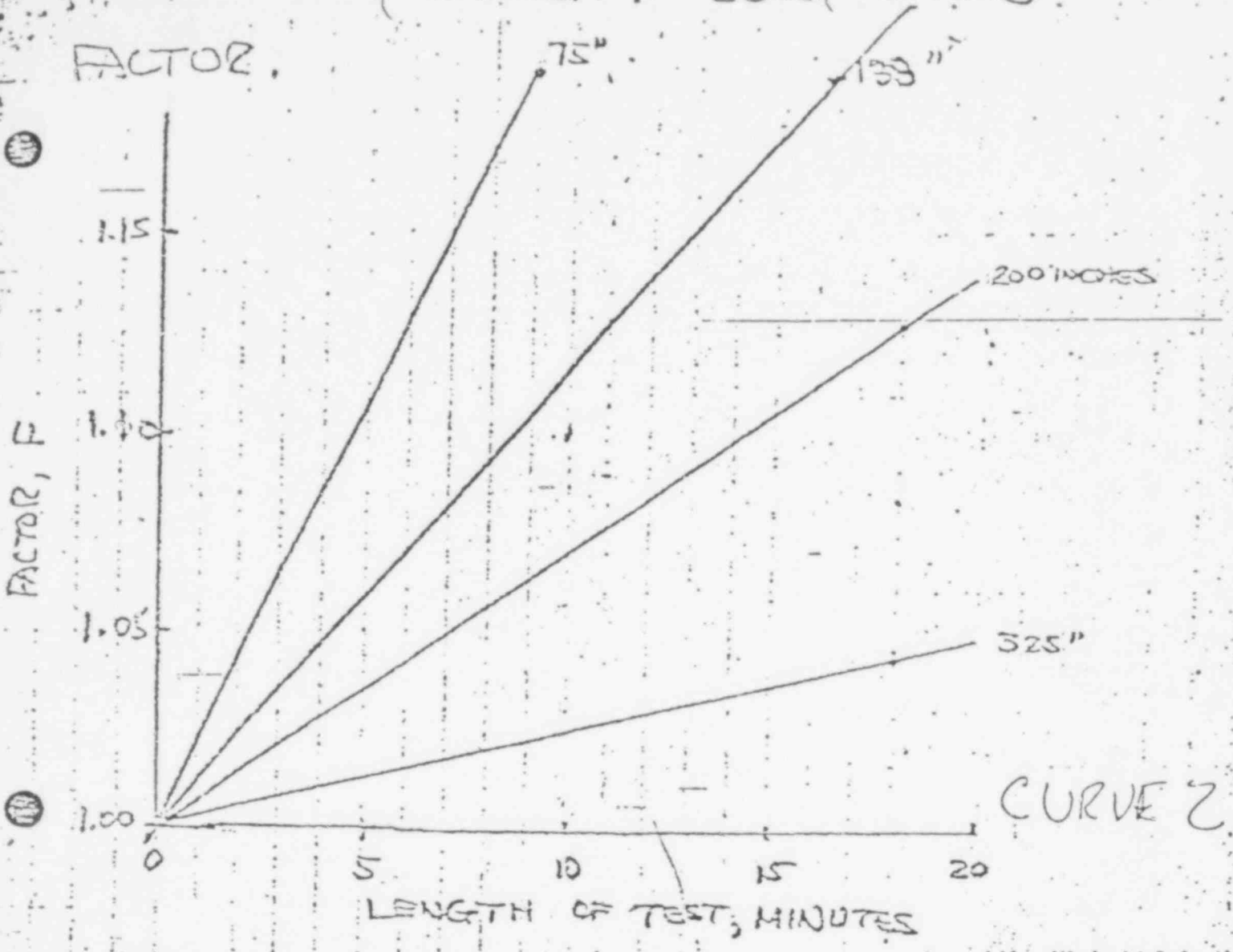
High Δp and low ΔT $\Rightarrow$ High Level

150 100


PRESSURIZER PRESSURE AND TEMPERATURE RESPONSES TO NET ENERGY UNBALANCE, VS. LEVEL
4/13/79
1000 PSI NOMINAL PRESSURE
8000 KWHIN
6000 KWHIN
4000 KWHIN
PRESSURIZER TEMPERATURE INCREASE °F
0
100
200
300
400
P
T

150 101

METAL HEAT CAPACITY CORRECTION FACTOR.



1. MEASURE PRESSURE INCREASE FOR A CALIBRATED NET ENERGY INPUT (EG. 800 KW HEATERS2 FOR 5MIN WITH NO SPRAY)
2. ENTER CURVE 1 TO AND APPARENT WATER LEVEL
3. USING THIS LEVEL, AND THE TIME PERIOD FOR THE TEST, ESTIMATE CORRECTION FACTOR F FROM CURVE 2 ABOVE,
4. INCREASE MEASURED PRESSURE SWING BY FACTOR F. (NEW PRESSURE = MEASURED X F)