

Reference 5

7

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

cc: D. A. Farnsworth
R. H. Stoudt

To: G. A. MEYER, FUEL ENGINEERING

RECEIVED

From: J. R. GLOUDEMANS, THERMODYNAMICS UNIT, TECHNICAL STAFF

APR 10 1979

G. A. MEYER 105 663-5

Cust. File No. or Ref. 045-7952-01

Subj. COOLDOWN PRESSURE Date APRIL 10, 1979

This letter is cover and customer and the subject only.

COOLDOWN PRESSURES FROM ATMOSPHERIC PRESSURE TO ~ 1800 PSIA HAVE BEEN CONSIDERED. THERE ARE MANY SYSTEM RESPONSES RELATED TO PRESSURE, THE ADVANTAGES OF COOLING AT HIGHER (UP TO ~ 1800 PSIA) OR LOWER (DOWN TO ~ 15 PSIA) PRESSURES ARE:

1. ADVANTAGES OF COOLING AT HIGHER PRESSURE

- a. GREATER MARGIN TO SATURATION TEMPERATURE.
- b. LESS STRAIN ON (OPERATING) RCP's.
- c. BECAUSE OF DECREASED EXPANSION OF FLUID DURING VAPORIZATION (SEE ATTACHED FIGURE), DECREASED FUEL OR FUEL-DEBRIS DISLOCATION DUE TO THE HEATING AND VAPORIZATION OF TRAPPED WATER.

2. ADVANTAGES OF COOLING AT LOWER PRESSURE

- a. BECAUSE NATURAL CIRCULATION IN RESTRICTIONS AND/OR AT "HOT SPOTS" MAY REQUIRE VAPORIZATION TO ACHIEVE THE NECESSARY STEADY-STATE DRIVING HEAD, AND VAPORIZATION EXPANSION INCREASES WITH DECREASING PRESSURE (SEE ATTACHED FIGURE), LOWER PRESSURE INFERS MORE ADEQUATE COOLING OF THE MORE-RESTRICTED FLOW REGIONS IN THE CORE.
- b. POSTULATING NATURAL CIRCULATION AND VOIDING AT CORE-FLOW RESTRICTIONS AS IN "2.a", AND NOTING THE DECREASE IN SATURATION TEMPERATURE WITH PRESSURE,

549165

7907260556

FOUR ORIGINAL

THE (FUEL) DEBRIS OR FUEL IN THE STARVED REGION IS AFFORDED A LOWER SURFACE TEMPERATURE (WITH LOWER PRESSURE).

- c. LESS PRESSURE-INDUCED STRESS ON BOUNDARY COMPONENTS.
- d. LESS BLOWDOWN (TO ATMOSPHERIC) LIKELIHOOD AND STRESS.
- e. FACILITATED SHIFT TO THE LOWER-PRESSURE DECAY-HEAT-REMOVAL SYSTEM.

I AM CERTAIN THAT LONG-TERM COOLING SHOULD NOT BE ACCOMPLISHED AT THE HIGHER PRESSURES CONTEMPLATED, 1000 to 1800 PSIA. THE ONLY SIGNIFICANT ADVANTAGE (1a), IS OUT-WEIGHED BY ITS COUNTERPART (2b); I.E., RAISING PRESSURE RAISES T_{SAT} AND DIRECTLY RAISES THE SURFACE TEMPERATURE OF THOSE FLOW-RESTRICTED DECAY-HEAT REGIONS WHICH REQUIRE BOILING FOR THEIR HEAT TRANSFER MECHANISM.

WHILE RCP'S ARE OPERATING, I RECOMMEND THE LOWER BAND OF THE CURRENT PRESSURE RANGE, I.E., $\sim 550 \pm 50$ PSIA. PRESSURE SWINGS SHOULD BE AVOIDED. (COOLDOWN SHOULD BE VERY GRADUAL). WHEN "COOLED DOWN" (TO APPROXIMATELY 100-200 F), AND WHEN RCP'S ARE NO LONGER AVAILABLE OR ARE NOT DESIRED FOR BACKUP, SYSTEM PRESSURE SHOULD BE SLOWLY REDUCED TO APPROXIMATELY 100 PSIA ($T_{SAT} \sim 328$ F). THIS LOWER PRESSURE INCREASES THE DRIVING HEAT AT VOIDING LOCATIONS AND DECREASES THE SURFACE TEMPERATURE OF BOILING-LIMITED FUEL, WHILE MAINTAINING MORE THAN 100F "MARGIN" TO SATURATION.

J. R. Gloudeans
J. R. Gloudeans

POOR ORIGINAL

VERIFIED 4/10/79 by

D. A. Farnsworth

J. R. Gloudeans for DAF

10166

