

I-MOSBA-226

Cooper Cameron Corporation
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DOCKETED
USMRC

'95 SEP -8 P4:13

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Cooper Energy Services

**ROBERT A. JOHNSTON'S PERSONAL NOTES
RELATING TO
JULY 1990 STARTING AIR VALVE PROBLEM**

COPY

NUCLEAR REGULATORY COMMISSION *INT.*

Docket No. *50-424 + 425 - UCR-3* EXHIBIT NO. *II-226*

In the matter of *Dr. Fredrick / Virginia*

Staff Applicant Intervenor Other

Identified Received Rejected Reporter *WJW*

Date *8-24-95* Witness *Raymond / Johnston*

9509130021 950824
PDR ADOCK 05000424
G PDR

II-226

Georgia Power 2A 76023

3 AM Wednesday morning attempted start - report slow 'sluggish' roll for full 5 seconds

Control panel relays tested to be OK, voltage present to at least left bank B & V's left bank distributor has connections to no. 5 & 8 LB cylinders

The two lowest tubes on RB distributor go to 3 & 6 RB

* Three of four historical engine failures to starts have been on the left bank distributor, one was with both banks operable.

Fireman order 3L - 6R - 8L - 1R - 5L - 4R



- ① Temporarily supply pilot signal to each of the starting air valves as listen to activation
- ② Use a hand tach to measure air roll RPM
 - 2A) Left bank dist.
 - 2B) Right bank dist
 - 2C) Both dist
 - 2D) Another engine
- ③ Low point tubing
- ④ Check for vent passage in gasket

Check of air start valve actuation
 by manually giving them a pilot
 air signal. OK vs. NO refers to
 a sharp audible opening and closing

8R	8R	8R	100 psi
1L NO	OK ^{slow} closure	1R NO	NO
2L OK ^{slow} closure	OK ^{sticking} on closure	2R OK	OK
3L OK	OK	3R OK	OK
4L NO	NO	4R OK	OK
5L NO	OK ^{slow} closure	5R OK	OK
6L NO	OK ^{slow} closure	6R NO	NO
7L OK	OK	7R NO	OK ^{slow} closure
8L NO ^{closure} OK	NO	8R NO	N/A ^{see} below

Pulled air start cap from no. 8 R,
 find cap and piston to be clean
 but with parts at keep warm temp
 can not pull piston from cap
 by hand, does not free up
 until parts cool to near ambient
 Checked valve actuation by hand,
 find it to be fine.

Thermal Expansions

Cast Iron 6.2×10^{-6} in/in/°F
Stainless Steel 18.54×10^{-6} in/in/°C
Cast Iron 10.61×10^{-6} in/in/°C

Assume Room Temp $25^{\circ}\text{C} = 77^{\circ}\text{F}$
→ 8.8×10^{-6}
8.9 x
 6.2×10^{-6}
→ 6.0 for cast

2.5. 2.8×10^{-6} 80

.00056 ~~ms~~ inch

7-13-90

Over the night Ray Howard and crew pulled the starting air valve caps from all cylinders and brought the caps and pistons to room temp, $\approx 75^{\circ}\text{F}$ or so. Parts were measured and all found to range around .001 diametrical clearance, they were then 'cleaned' sufficiently to establish .002 to .003 inch diametrical clearance and reassembled. Upon assembly all actuated sharply with 100? psi pilot air. Ray did report finding some oil on the top of 5 bolts piston but note that this was one which did actuate yesterday. Ray also had his people manually open each valve and reported that they all function OK though one seemed a little tight.

The engine was operated at 7 megawatts for approx 1 hour to get the upper end good and hot, hotter than can be expected during stand by keep warm. Each air start valve was then tested at 100 psi pilot pressure, oil temp at time of test 169°F out.

1L	OK	fairly quiet closure	1R	OK	quiet closure
2L	OK	crisp	2R	OK	
3L	OK	crisp	3R	OK	
4L	OK	fairly quiet closure	4R	OK	
5L	OK	fairly quiet closure	5R	OK	
6L	OK	crisp	6R	NO	
7L	OK	crisp	7R	OK	quiet closure
8L	OK	crisp	8R	OK	fairly quiet closure

Note that we can now ^{hear} ~~here~~ some blow by past the piston which was not audible yesterday.

Find on no 6 R that loosening
the exhaust side air start
valve cage bolt about
an $\frac{1}{8}$ turn freed it up,
the valve was stuck
open and closed upon
loosening.

Pulled the cap off and
piston is free

From Lanny

Cap	2.2505	2.2495
Piston	2.2485	2.2475

Resulting in .001/.003 diam.

No control of flatness, TIR
or otherwise.

Valve caps show tooling marks to indicate machining by lathe.

Have asked that 7 suspect valves ~~be~~ have caps removed and checked for flatness, pull new valves from stock and take their caps off. Verify flatness of flange. Check dimensionally for diametrical clearance with respective existing piston. Modify with emery if necessary to bias clearance towards .003 inch. Reassemble and retest after brief period of 15 min

CPSES

817-897-6002

Tom Ryan

Dan Pool

9/7/90
Engine # 76024

Operating data at full load being
taken with En-Spec.

From Control Panel

At 12:16 PM ^{~ time when data} recorded from No. 34B

Phase A 1000 AMPS

B 990

C 970

46 "Hg

46.5 "Hg

No 1 LB	981 36mm	17B	1027 36mm
2	1011 35--	2	1035 35mm
3	1022 37mm	3	1027 36mm
4	993 37mm	4	985 37mm
5	1008 37mm	5	983 30mm
6	974 37mm	6	773 37mm
7	1017 36mm	7	1019 35mm
8	1025 37mm	8	1010 36mm

12:49 pm - time at which data
recorded from No. 3 RB

A phase 960 mm Hg

B 950

C 920

43.5 " Hg

43.5 " Hg

LB No. 1 969

1007

2 997

1020

3 1004

1011

4 979

970

5 992

969

6 959

981

7 1004

1004

8 1009

999

Manifold temp $\approx 145^{\circ}\text{F}$