

**LISEGA****CALCULATION SHEET**By *WPC* Date *12/23/04*Chk *W. Bailey* Date *12/23/04*Report No. ER-VR04-0752**PURPOSE:** Perform evaluation of reservoir isolation valves for 307256 snubbers returned from PSE&G.**INPUT DOCUMENTS:**

1. QC-013, claim # 2004CC133, dated 12/06/04.
2. Variance Report # 04-0752.

OUTPUT DOCUMENTS:

1. Test Certificate, PSE&G Demo, 12/13/04

DISCUSSION: The following discussion includes observations and actions related to this evaluation

The returned components were inspected, and one cap assembly was installed in a spare snubber at LISEGA Inc. The discussion begins with the observation of the damaged snubbers at the PSE&G facilities.

Damage to Reservoirs:

It appears that the reservoir isolation valves may not have totally closed when the compression lock up and bleed rate testing was performed. This would have caused extra fluid to transfer from the pressurized side of the cylinder into the reservoir. This would not have caused reservoir damage if only tested once. Repeated testing over a short time, however, could force enough fluid into the reservoir to compress the reservoir spring to solid height, and overload the snap ring used to retain the reservoir assembly.

Improper closing of valves:

A close inspection of the valve cages revealed a slightly raised and polished ring in the valve cage just below the fully open valve poppet position, an abnormality apparently related to application specific influences. This ring appeared to cause the poppet to "catch" as it went to close, and cock slightly in the cage. This kept the poppet from closing flush with the seat, which allowed fluid to bypass the poppet and flow into the reservoir. This characteristic seemed to appear only when the poppet was activated slowly.

Operability of the snubbers:

When in application, the snubbers are intended to react to seismic disturbances and dynamic events (typically at frequencies between 3 and 33 Hz). At these frequencies, all valve poppets close virtually instantaneously. It is our opinion that the small indication in the cage would not effect the poppet in this mode of operation.

To provide objective evidence in this regard, we installed one of the returned rear caps, serial number 61373/91, (with isolation valve as found in PSE&G snubber) into a spare 307256 snubber, Serial number 99614230/005. The snubber was filled with AK 350 fluid, the fluid utilized in all snubbers supplied to PSE&G. We performed an engineering evaluation test, similar to a standard production test on the snubber, which includes a dynamic test at 5 Hz. The test results are attached for information. The lockup and bleed, together with the dynamic test, reflects normal operation of the snubber (and therefore the isolation valve).

Conclusion:

The repeated testing in compression of the HPCI snubbers resulted in an over-pressurization of the reservoirs. This appeared to be due to the failure of the isolation valves to close completely during the tests. The closing of the isolation valves appeared to be affected by an irregularity in the valve cage observed near the fully open position of the poppet. This condition was aggravated/attenuated by slow closing velocities. When testing for lockup speeds, the snubber is accelerated rather slowly to obtain accurate, distinct lockup velocities. These velocities are much slower than those imposed during actual application.



LISEGA

CALCULATION SHEET

By *NPC* Date *12/23/04*

Chk *W. B. Only* Date *12/23/04*

Report No. ER-VR04-0752

The LISEGA test equipment applies high velocity loading to the bleed rate test, and applies dynamic input at 5 Hz as well. Tests on one of the rear cylinder caps returned from PSE&G showed normal operation on these performance tests. Based on this, there is no reason to question the operability of the snubbers in application, as the phenomenon of slow application of increasing velocity is not found in the practical application of these components.

Proposed corrective action

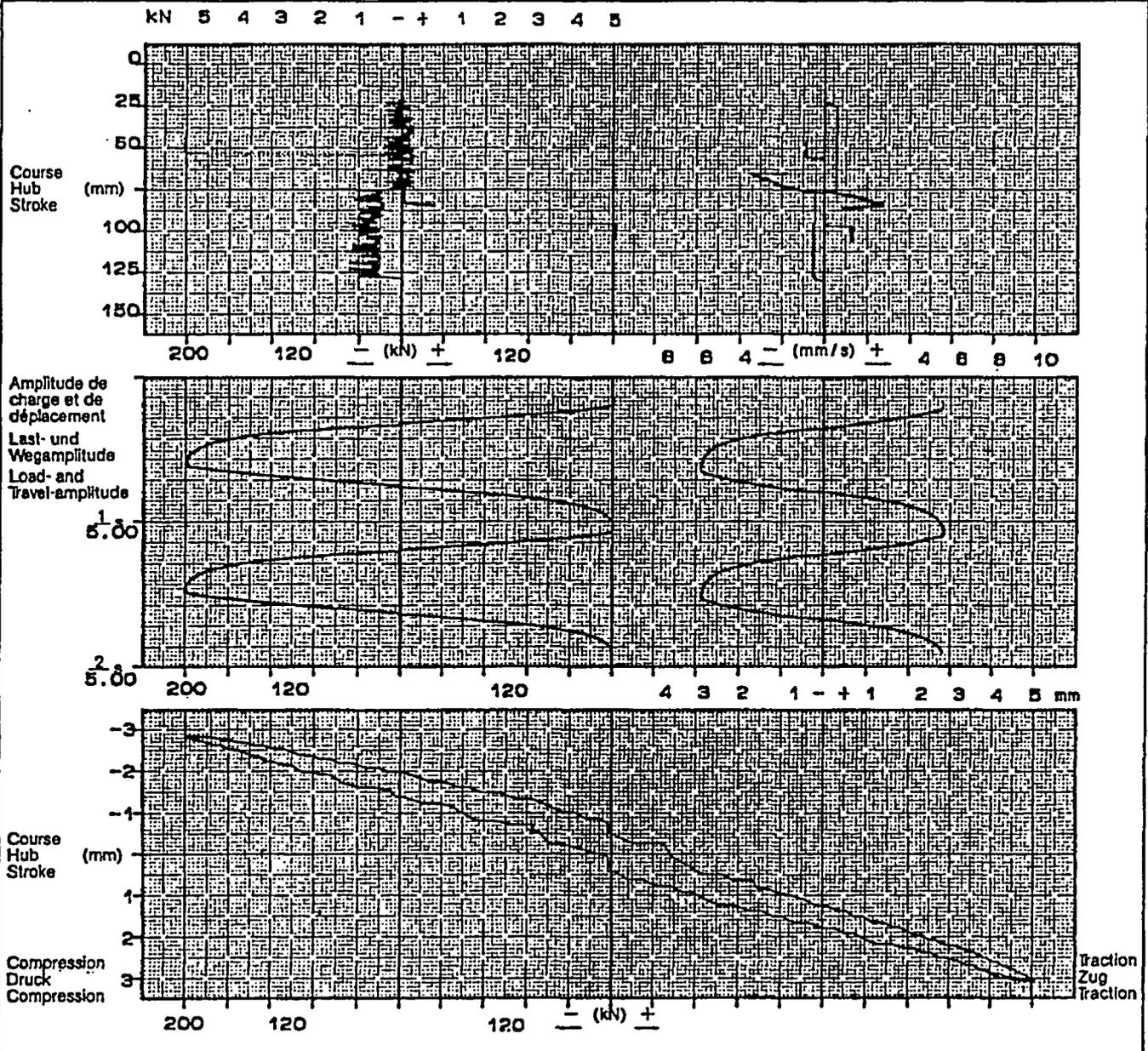
When performing operability testing, should a compression test for lockup and bleed result in partial load indications, the snubber should be returned to the original "test start" position, and the ramp rate of the test stand increased substantially. Should this repeat test still result in a partial load only, the testing should be stopped, and LISEGA should be notified for further review/discussion.



PROCESS VERBAL D'ESSAI
PRÜFPROTOKOLL
TEST CERTIFICATE

N° SNP 0497/DZ V1.1 TC4
No 307256
FA N° *SUBJECT BODY SUR*
FA Nr. *1007* N/A
FA No 99614230/005

| | | | |
|--|---|--|---|
| Type Typ Type 307256 | Charge nominale Nennlast Mean load 200.00 kN | Pos. PSE&G Demo PSE&G Iso. Vlv. | Conditions d'essai Prüfbedingung Conditions of testing EVALUATION VOSP-18 TEST |
| Mode de pilotage Steuerungsart Manner of Induction auto | Fréquence Frequenz Frequency 5.00 Hz | Nombre de cycles Lastwechsel Number of cycles 380 | Température d'essai Prüftemperatur Test temperature 20 °C |



| | | | |
|---|--|---|---|
| Compression Druck Compression -197.51 kN | Traction Zug Traction 200.00 kN | Ralheur propre du banc Masch. Einfederung Machine elasticity 2.39 mm | Déplacement Schwingbreite Displacement 3.29 mm |
| Accélération de blocage / Ansprechbeschleunigung / block. acceleration Vitesse de fermeture / Schließgeschwindigkeit / closing speed | | Vitesse de by-pass / Bypassgeschwindigkeit / by-pass speed | |
| Compression Druck Compression -3.52 mm/s | Traction Zug Traction 2.64 mm/s | compression Druck Compression -0.92 mm/s | Traction Zug Traction 1.25 mm/s |
| Friction Reibung Friction -1.31 kN | Mesure de course Hubmessung Stroke test 151.69 mm | Niveau d'huile Ölstand Oil level AK 350 OK | Contrôle détanchéité Dichtigkeitskontrolle Leakage test OK |
| force de décolage Losbrechkraft Break-away force 1.91 kN | Mobilité des rotules Lagerspiel Bearing play OK | Nom / Visa Name / Name Name / Visa <i>Andretti</i> | Date Datum Date 12/13/04 |
| Les valeurs mesurées sont conformes aux exigences de la spécification Die gemessenen Werte entsprechen den Anforderungen der Spezifikation The recorded values are in conformity with the specification | | LISEGA A.Q./Q.S./Q.A. Client / Besteller / Customer | |