LISEGA

LISEGA Inc
375 Lisega Boulevard
Newport, TN 37821

30 July 2007

U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attn: Mr. John McHale
Branch Chief NRR/DCI/CPTB
Mail Stop O-9D3

Sub: LISEGA Information Bulletin August 24, 2004

Dear Mr. McHale,

The testing addressed in the above Information Bulletin has been completed, and the attached final report has been distributed through both the Snubber User's Group and the LISEGA User's Group.

LISEGA does not intend to perform any additional testing regarding the AK 350 fluid, and will continue to offer both AK 350 and AP 280 fluids to our customers.

Thank you for your interest and assistance in this matter.

Sincerely,

Robert E. Fandetti
Director, Nuclear Sales
Technical Specialist
LISEGA Inc.

423 625-2225 Phone
423 625-9009 Fax

IE19
Add: John McHale

Test Report

N°: QSPB002/2004

Subject: Testing of Snubber Function before and after Gamma Radiation

Radiation dose: In a range between a total dose of $1x10^7$rad and $5,5x10^7$rad

Products: LISEGA Hydraulic Snubber filled with silicon fluid type AK350

These snubbers are based on the LISEGA catalogue Standard Supports 2010.

- 30 18 56
- 30 38 56
- 30 42 56
- 30 52 56
- 30 72 56

Date: 31.05.2005

Rev: D : Typos corrected and finilized the note under §6

-Dipl.-Ing. H. Bardenhagen -	-Dipl.-Ing. J.Bernert -	- Dr.-Ing. H.-W. Lange –
Quality Management	Design & Development	Research &Techn. Cord.

Test Report

N°: QSPB002/2004

1.0 Purpose of the tests

The purpose of this testing is to evaluate the effects of increased radiation similar to an accident condition on the LISEGA Hydraulic Snubbers when filled with AK 350 silicon fluid.

2.0 Basic documents

LISEGA Test regulation VQSP 19 Rev. D
LISEGA catalogue - Standard Supports 2010

3.0 Test equipment

Function testing:
LISEGA function test benches 100 kN

- No. FP6 / E16 with 3kN, 25kN and100kN load cells.

Radiation:
The gamma radiation has been performed at a German nuclear test power station - GKSS Forschungszentrum, Max-Planck-Straße, D-21502 Geesthacht - which is located near Hamburg, Germany.

During the radiation testing, the snubbers were placed in a water basin and set in front of the radiation fuel plates. See figure 1 under 4.2.

4.0 Performing the tests and radiation

4.1 Function tests

1.) Before radiation:
Each snubber is tested at normal room temperature on the LISEGA test bench. The functional tests have been performed in accordance with the LISEGA test procedure VQSP 19 Rev. D. This test includes measuring of the following elements in both compression and traction direction:

- Lock up velocity,
- By–pass speed (bleed rate)
- Friction (drag)

2.) After radiation:

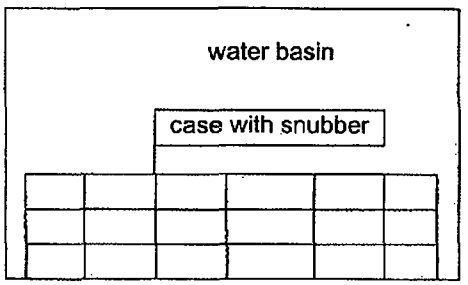
a) Tests are performed as describe under item 1, above, and have been repeated with each snubber at room temperature.
b) Measurement of by-pass speed under mean load at 73°c (163°F) and / or 93°C (200°F) was performed when it was required to get more information
c) Additionally, some snubbers have had performed the by-pass speed and friction testing under their Level C and Level D rated loads to get additional information when room temperature and normal mean load testing was inconclusive.

4.2 Radiation

Each snubber type was installed in a closed test case. The material grade of the test case was austenitic with wall thickness of 3mm.

The snubbers were placed in the water basin in front of the radiation fuel plates (see figure 1.

Figure 1: - Location of specimen



□□□ = radiation fuel plates

The radiation fuel plates have a dimension of nearly 70mm to 75 mm and a length of 600 mm and placed in a rectangular array.

4.2.1 Radiation Dose Calculation

Before each radiation test a radiation profile of the radiation fuel plates was prepared.

On the basis of this radiation profile the radiation intensity was measured at the point of impact and the point of exit on the snubber. The mean value was established from the radiation doses at entry and exit. The mean value of this radiation dose determined the duration for reaching the stipulated total dose.

a) Snubber type 301856 - serial number 03615870

Total dose	current-n° of serial batch
2.6×10^7:	144
4.0×10^7:	158
5.5×10^7:	145

b) Snubber type 303856 - serial-number 04616480

Total dose	current-no. of serial batch
2.6 x 10^7:	039
4.0 x 10^7:	083
5.5 x 10^7:	040

c) Snubber type 304256 - serial-number 04616530,

Total dose	current-no. of serial batch
2.6 x 10^7:	049
4.0 x 10^7:	090
5.5 x 10^7:	050

d) Snubber type 305253 - serial-number 0461340,

Total dose	current-no. of serial batch
1.0 x 10^7:	042
2.0 x 10^7:	075
3.0 x 10^7:	076
4.0 x 10^7:	077
5.0 x 10^7:	078
5.5 x 10^7:	079

e) Snubber type 307256 - serial -number 04615770

Total dose	current-no. of serial batch
2.6 x 10^7:	28
5.5 x 10^7:	25

5.0 Result

Table 1 - 301856

b)Type 301856 - 03615870 :										
Total Dose	**Curr. No.**	**Test Temp.**		**Lock up velocity**		**By-Pass (bleed rate)**		**Drag Force**		**Remarks**
				Comp	Tra	Comp	Tra	Comp	Tra	
				mm/s	mm/s	mm/s	mm/s	kN	kN	
2.6x10^7	/144	20°C (68°F)	before	3.46	3.67	0.88	0.78	0.07	0.03	
			after	2.06	2.27	0.32	0.29	0.02	0.02	
4.0x10^7	/158		before	3.19	3.66	0.58	0.72	0.07	0.03	
			after	1.87	1.17	0.01	0,01	1.15	1.62	Rev. B
5.5x10^7	/145		before	3.38	3.56	0.61	0,08	0.06	0.02	Rev. B
			after	2.43	----	0.05	----	N/A	N/A	*1

Test Report

N°: QSPB002/2004

*1) A measuring of lock up velocity an bleed rate in traction direction was impossible. The valve didn't closed. After disassembling the snubber, if was found that the fluid was jelled. Some travel was seen due to air in system.

Table 2 - 303856

c) Type 303856 - 04616480:										
Total Dose	**Curr. No.**	**Test Temp.**		**Lock up velocity**		**By-Pass (bleed rate)**		**Drag Force**		**Remarks**
				Comp	Tra	Comp	Tra	Comp	Tra	
				mm/s	mm/s	mm/s	mm/s	kN	kN	
$2.6x10^7$	/039	20°C (68°F)	before	3.04	3.44	0.94	1.43	0.1	0.14	
			after	2.56	2.90	0.75	1.21	0.09	0.01	
$4.0x10^7$	/083		before	3.18	3.44	0.81	1.09	0.1	0.03	
			after	4.89	8.03	0.08	2.80	0.02	0.05	
$5.5x10^7$	/040		before	3.46	3.44	0.82	1.08	0.15	0.09	
			after	2.09	2.11	0.37	0.57	0.04	0.05	

Table 3 - 304256

d) Type 304256 - 04616530:										
Total Dose	**Curr. No.**	**Test Temp.**		**Lock up velocity**		**By-Pass (bleed rate)**		**Drag Force**		**Remarks**
				Comp	Tra	Comp	Tra	Comp	Tra	
				mm/s	mm/s	mm/s	mm/s	kN	kN	
$2.6x10^7$	/049	20°C (68°F)	before	3.50	3.78	0.91	1.15	0.20	0.05	
			after	2.43	2.69	0.64	0.89	0.08	0.02	
$4.0x10^7$	/090		before	3.33	3.33	0.87	1.11	0.20	0.05	
			after	2.25	1.58	0.39	0.53	0.06	0.08	
$5.5x10^7$	/050		before	3.70	3.63	0.90	1.12	0.19	0.07	
			after	4.21	0.96	0.24	0.35	0.09	0.17	

Test Report

N°: QSPB002/2004

Table 4 - 305253

e) Type 305253 - 04616340:										
Total Dose	**Curr. No.**	**Test Temp.**		**Lock up velocity**		**By-Pass (bleed rate)**		**Drag Force**		**Remarks**
				Comp	Tra	Comp	Tra	Comp	Tra	
				mm/s	mm/s	mm/s	mm/s	kN	kN	
$1.0x10^7$	/042	20°C (68°F)	before	4.28	3.67	0.70	1.03	0.21	0.06	
			after	3.83	3.47	0.64	0.98	0.22	0.1	
$2.0x10^7$	/075	20°C (68°F)	before	3.85	3.60	0.70	1.06	0.26	0.06	
			after	3.05	2.72	0.54	0.82	0.06	0.11	
$3.0x10^7$	/076	20°C (68°F)	before	3.90	3.89	0.71	1.02	0.28	0.06	
			after	2.92	2.83	0.46	0.70	0.1	0.09	
			load level C			0.66	1.00			
			load level D			0.84	1.35			
		73°C (163°F)	after	4.38	4.49	0.81	1.27			
			load level C			1.08	1.60			
			load level D			1.36	2.03			
		93°C (200°F)	after	6.96	7.48	1.38	2.17			
			load level C			1.32	1.98			
			load level D			1.68	2.51			
			before	3.89	3.76	0.73	1.06	0.30	0.11	
			after	4.02	3.59	0.39	0.63	0.06	0.13	
			load level C			0.52	0.83			
			load level D			0.69	1.12			
		93°C (200°F)	after	5.1	5.3	0.99	1.56	0.18	0.32	
			load level C			1.19	1.85			
			load level D			1.52	2.4			
$5.0x10^7$	/078	20°C (68°F)	before	3.60	3.45	0.70	1.04	0.28	0.09	
			after	3.04	3.70	0.28	0.49	0.14	0.19	
$5.5x10^7$	/079	20°C (68°F)	before	3.77	3.77	0.72	1.05	0.29	0.1	
			after	3.0	3.4	0.42	0.59	0.14	0.19	

Table 5 - 307256

f) Type 307256 - 04615770:										
Total Dose	**Curr. No.**	**Test Temp.**		**Lock up velocity**		**By-Pass (bleed rate)**		**Drag Force**		**Remarks**
		20°C (°F)		Comp	Tra	Comp	Tra	Comp	Tra	
				mm/s	mm/s	mm/s	mm/s	kN	kN	
$2.6x10^7$	/28	20°C (68°F)	before	3.817	3.333	0.988	1.287	0.15	0.81	
			after	3.182	2.966	0.812	1.106	0.50	0.51	
$5.5x10^7$	/25	20°C (68°F)	before	3.889	3.365	0.978	1.279	0.42	0.74	
			after	2.536	2.397	0.702	0.972	0.31	0.74	

During the test of the hydraulic snubbers no leakage occurred at any time. This applies to tests both before and after radiation.

6.0 Summaries

Based on trends observed with types 301856 and 305256 and the intermediate results achieved with types 303856 and 304256, it did not appear sensible to further maintain the full range of dose level data points established at the beginning of the testing with 1.0; 2.0; 3.0; 4.0, 5.0 and 5.5 x 10 exp.7 rad. With the total doses of 2.6 x 10exp.7, 4.0 x 10exp.7 and 5.5 x 10exp.7 with the smaller ones and the total dose 2.6 x 10exp.7, and 5.5 x 10exp.7 with the larger snubber type 307256 sufficient conclusions can be drawn regarding function after irradiation.

The tests at increased temperatures after irradiation show that the oil which has thickened during irradiation again becomes less viscous and, because of this, some movement of the snubber in part (according to level of total dose) under certain forces is possible.

It may likewise clearly be said that with increased self-shielding – increase of material thickness with larger hydraulic snubbers eg. 305256, 307256, there is a lesser change in the constitution of the oil because of the gamma irradiation.

Note: An earlier test, performed under different conditions, yielded incongruous characteristics when compared to the data presented herein. This anomaly has not repeated through the course of all other test. The questionable data from this one early test, performed under different conditions, is not reflected in the test results presented here.

Although some additional testing was performed on 301856 snubber between 2.6 and 4.0 x 10 exp.7 the results were similar to those at. 4.0. Therefore, these test results have not been incorporated in this final revision.

7.0 Attachments

- Declaration of measuring of radiation

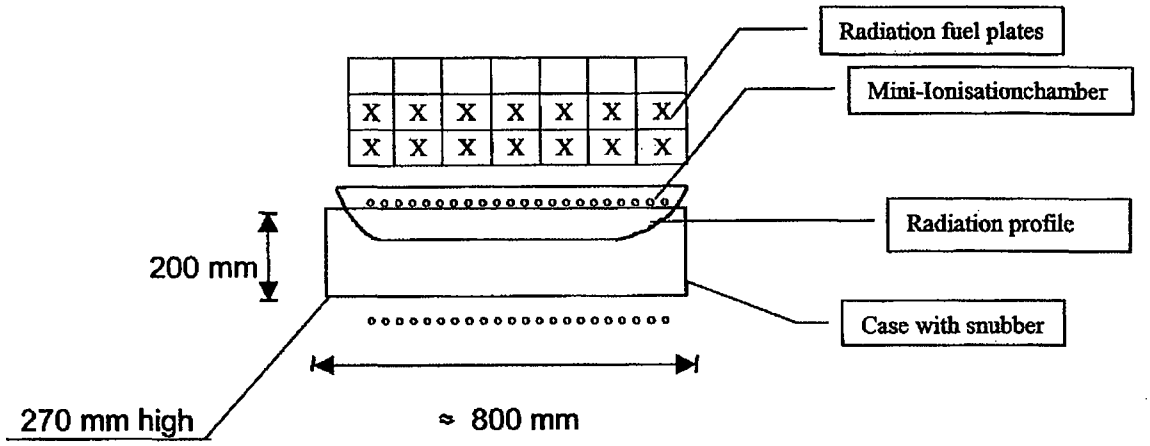
Attachment 1 to Test record QSPB002/04

Declaration of measuring dose rate during radiation of LISEGA hydraulic snubbers

To Figure 1 of Section 4.2: Snubbers in front of the radiation fuel plates

The radiation has been performed in a pool of arrangement burn down fuel elements at the German nuclear test power station Geesthacht. Base on the time the elements have been taken away out of the reactor itself, the rest radiation dose of each radiation fuel plates is different.
Before starting the test the radiation dose was measured with a Mini-Ionisationchamber = Gammasonde in front and behind the closed case, where the snubbers are placed.
The small different of radiation flow between the aluminium in which the sonde is placed and austenitic, in which the snubbers are placed, are calculated. Bothe area. In which the sonde was placed and the snubber are placed is dry.
Out of this combination a radiation profile was calculated to appoint the radiation time to reach the total radiation dose.

Figure A



Attachment 1 to Test record QSPB002/04

Figure B

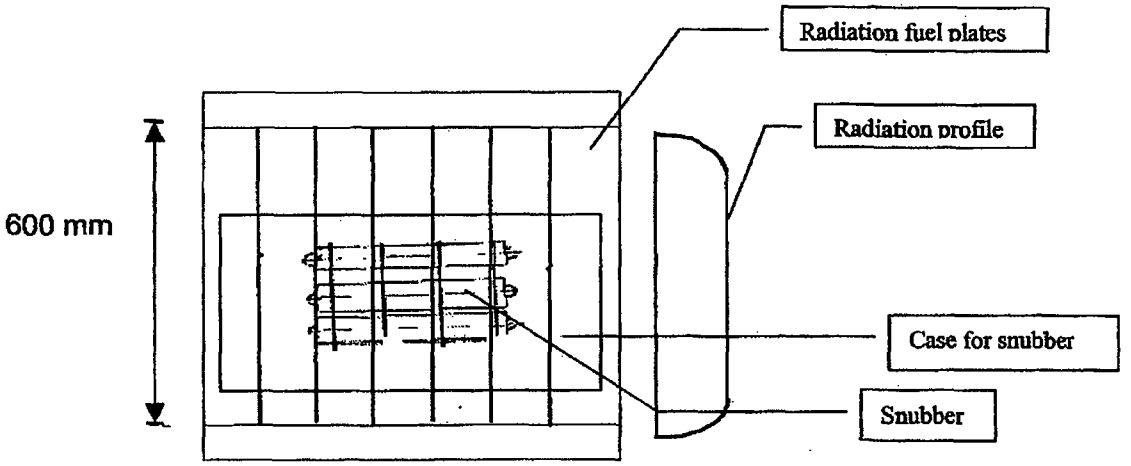
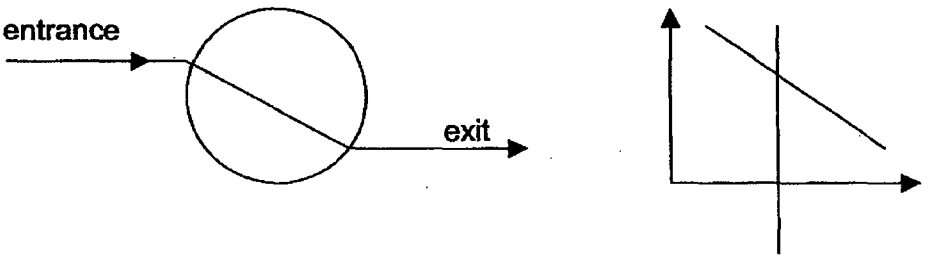
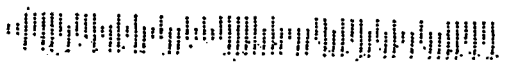


Figure C





7006 0810 0004 9765 9486

FROM: LISEGA

375 LISEGA BOULEVARD
NEWPORT, TENNESSEE 37821

TO: Document Control Desk
US Nuclear Regulatory Commission
Washington, DC
20555-0001