

**From:** Saverot, Pierre  
**Sent:** Wednesday, October 27, 2010 7:51 PM  
**To:** 'Troy Hedger'  
**Cc:** Raul Pomares; Harold Dulofsky; Turner, David W. (GE Power & Water) (davidw.turner@ge.com); Michael Schrag (michael.schrag@ge.com)  
**Subject:** AOS response to the structural issue described in this e-mail is requested for this Friday.

Troy,

Please provide us with a full and detailed explanation/write-up, with all clarifications you deem necessary, so that the review of this application can continue.

I am expecting to receive your response by COB Friday.

Thanks

Pierre

#### Summary of the structural issue:

*Note: in this discussion, “bottom” means the surface of the impact limiter which contacts the ground, and “top” refers to the impact limiter surface that contacts the cask in an “end drop” event.*

AOS' approach to qualifying the package to 30-ft drop conditions is to deform a Finite Element (LIBRA) model of the impact limiter at the “bottom” of the impact limiter (with the “top” fixed) until the strain energy equals the potential energy of the package for a 30-ft drop. Subsequently the reaction forces from these analyses are applied to the cask with equilibrating body forces to determine the effects on the cask.

In Section 2.7.1.1.3 of the SAR, a correlation between impact limiter test deformations and LIBRA is presented. Figure 2-32 is a photograph of a post-end-drop-test AOS-165 sectioned impact limiter which is used to correlate with analysis results. The total height deformation is calculated from the Figure 2-32 photograph as 4.4 in, and compared to an analysis value of 5.5 in. (Note: SAR page 2-88, last two sentences, compare this figure to Figure 2-39, which is a *side* drop. Assuming a typo, the correct reference is Figure 2-29, but this is for a AOS-100 model. This, however, does not change the issue).

It is apparent from the photograph in Figure 2-32 that the test impact limiter did not deform as assumed in the analysis. Instead of the “bottom” of the impact limiter flattening out (as shown in Figure 2-29), it is obvious that a significant deformation occurred at the “top” of the impact limiter, corresponding to the cask pushing *into* the impact limiter. This accounts for the deformation at the center of the impact limiter where the foam separated from itself.

Further indication that this occurred is given in p. 2-830 of the SAR (Image 5). The impact limiter deformations at the “bottom” surfaces at the center edges are 2.416 in and 1.745 in, which average 2.081 in (curiously, the reference datum for deformations, the “top” surface, is missing from this image). If this is so, then compared with the Figure 2-32 value for total deformation of 4.4 in, then  $4.4 - 2.081 = 2.32$  in of deformation must have come from the “top” surface of the

impact limiter (pulling down the inner top edges of the impact limiter, as is evident in the top left side of Figure 2-32).

Hence, more than half of the deformation in the impact limiter occurs at the “top” surface, and thus the analysis assumption that the “top” is restrained and the “bottom” moves is incorrect. The displacement distribution, and thus the strain, stress, and derived forces, must be incorrect. Similar behavior accounts for the inner surface gaps shown between pre- and post-test profiles in the Side Drop and Slapdown images in SAR pages 2-831 and 2-832.

In light of this, the methodology employed cannot be considered to be appropriate to evaluate the package for regulatory drop conditions.

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**From:** Troy Hedger [<mailto:THedger@alpha-omegaserv.com>]  
**Sent:** Wednesday, October 27, 2010 3:53 PM  
**To:** Saverot, Pierre  
**Cc:** Raul Pomares; Harold Dulofsky; Turner, David W. (GE Power & Water) ([davidw.turner@ge.com](mailto:davidw.turner@ge.com)); Michael Scharg ([michael.schrag@ge.com](mailto:michael.schrag@ge.com))  
**Subject:** RE: Response to todays call

Pierre:

Assuming we are correct on the question. We should have a response in 2 days upon your confirmation.

Thanks,  
Troy

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**From:** Saverot, Pierre [<mailto:Pierre.Saverot@nrc.gov>]  
**Sent:** Wednesday, October 27, 2010 11:57 AM  
**To:** Troy Hedger  
**Cc:** Raul Pomares; Harold Dulofsky; Turner, David W. (GE Power & Water) ([davidw.turner@ge.com](mailto:davidw.turner@ge.com)); Michael Scharg ([michael.schrag@ge.com](mailto:michael.schrag@ge.com))  
**Subject:** RE: Response to todays call

Troy,

This is a correct approach. However, Management wants to know when you will provide this clarification memorandum so that the review can progress. How long will it take to clarify this issue: 1 or 2 days? Surely not a week !!

What I don't understand is that this seems to be a recurring topic. So, you should be very detailed in your explanations. Right? I do not envision more than a few pages (3 or 4 total) referencing a table to a figure, a model to a result, etc...

Pierre

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**From:** Troy Hedger [<mailto:THedger@alpha-omegaserv.com>]  
**Sent:** Wednesday, October 27, 2010 2:51 PM  
**To:** Saverot, Pierre

**Cc:** Raul Pomares; Harold Dulofsky; Turner, David W. (GE Power & Water) ([davidw.turner@ge.com](mailto:davidw.turner@ge.com));  
Michael Schrag ([michael.schrag@ge.com](mailto:michael.schrag@ge.com))  
**Subject:** Response to todays call

Pierre:

Following is our plan on answering the Structural question posed by John Vera:

- 1) Generate the question we believe John is asking. (will send this to you tomorrow)
- 2) We would receive back from you or John confirming our understanding of his concern.
- 3) We would respond accordingly.

Does this work for you?

Thanks,  
Troy

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### E-mail Properties

Mail Envelope Properties (36CF286628C20846A68047F24632330933FF90AFA0)

**Subject:** AOS response to the structural issue described in this e-mail is requested for this Friday.  
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**From:** Saverot, Pierre

**Created By:** Pierre.Saverot@nrc.gov

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