

**R N A Consulting, Incorporated**  
*Specializing in forensic materials engineering and sciences*

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Mark D. Epstein  
Alborg, Velluva, & Epstein, LLP  
200 Pringle Ave., Suite 410  
Walnut Creek, CA 94596-7381

Re: Shalaby matter: Review of Reports. Comments.

Dear Mr. Epstein:

At your request, I have reviewed the reports of Exponent and of Thomas Eagar. My comments on their reports are presented below:

**Exponent report by Timothy Meyers and William Kane:**

The investigators did no testing of MAPP gas cylinders and relied on reviewing various documents to form their opinions. The Exponent report proposes three different scenarios that result in the cylinder contents burning Mr. Shalaby. There is no basis to select among the 3 case scenarios that they describe, and the report concludes that “the cause of the fire and Mr. Shalaby’s burns is undetermined.”

**Report of Thomas Eagar:**

Dr. Eagar did no testing of the MAPP gas cylinders and relied on his review of various documents and Code CFR 178.65 requirements to reach his opinion that the cylinder Mr. Shalaby was using did not have deficiencies in design, in material, and in manufacture. He states “It is improbable that a manufacturing deficiency significant enough to result in a failure of the cylinder in service, will ship from the manufacturing facility.” He arrives at abuse being “the sole probable cause of cylinder failure.”

**Robert N. Anderson Review and Comments:**

CFR 178.65 (iii) states “Brazed seams must be assembled with proper fit to ensure complete penetration of the brazing material throughout the brazed joint.” Metallographic examination of a number of commercially obtained cylinders showed this was not the case for the brazing of the center valve to the cylinder and that Bernzomatic was in violation of this requirement. This fact would indicate that the manufacturing deficiency should not be ruled out by Dr. Eagar.

If Bernzomatic could not ship a defective cylinder, as stated by Dr. Eagar in his report, then it would necessarily explain all failures in service to be caused by abuse. However, it would not explain the defective brazing found on the commercially obtained cylinders I examined. Also, there is no review of the quality control procedures or analysis to support this claim that a defective cylinder will not leave the manufacturing facility

Dr. Eagar did not review or comment on the other failures of MAPP gas cylinders that have occurred around the country.

Dr. Eagar states “that the braze joint did not fail....” He also states: “It requires a substantial force or impact to split the steel in the cylinder as described by the witnesses.” The amount of “substantial force” required was not determined or estimated by Dr. Eagar, nor does he have enough information to assert that the braze joint in Mr. Shalaby’s cylinder did not fail.

He is silent on what the level of abuse is to be critical and if Bernzomatic should consider the possibility of customer abuse and therefore design against it, since the consequences are so grave.

### **Test Observations:**

I performed testing of the MAPP gas cylinders and determined that the center valve fitting would fail at approximately 30 foot-pounds of force. The failures can happen in the cylinder wall or the brazed joint. This amount of force appears to be above the normal abuse level.

Additionally, flame tests were carried out to demonstrate the failure of the brazed fitting and the characteristics of the resultant fire that occurred at failure.

Please call me if you have any questions.

Sincerely,

Robert N. Anderson, Ph.D., P.E.