



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATIONS STATUS CHANGE

SUMMARY

Report:	Kleen Energy Natural Gas Explosion
Recommendation Number:	2010-07-I-CT-UR6
Date Issued:	July 12, 2010
Recipient:	Solar Turbines, Inc.
New Status:	Closed – Acceptable Action
Date of Status Change:	February 15, 2016

Recommendation Text:

Provide to your customers:

- a) *Comprehensive technical guidance on inherently safer methods for cleaning fuel gas piping, such as the use of air or pigging with air.*
- b) *Comprehensive Cleaning Force Ratio (CFR) guidelines, specifying both the upper and lower limits required to obtain satisfactory cleaning for the fuel gas piping for purposes of the warranties of the turbines.*
- c) *Warnings against the use of fuel gas to clean pipes.*

Board Status Change Decision:

A. Rationale for Recommendation

Combined-cycle natural gas power plants generate electricity with combustion turbines fired by natural gas. When new piping is installed, it must be cleaned of debris that may have been introduced into the piping during construction. Turbine manufacturers typically require power plants to meet fuel piping cleanliness standards as part of the turbine warranty requirements.

On February 7, 2010, an explosion occurred during the planned cleaning of fuel gas piping at Kleen Energy, a combined-cycle, natural gas-fueled power plant under construction in Middletown, Connecticut. Immediately prior to the explosion, workers were conducting a “gas blow,” whereby natural gas is forced through the piping at a high volume and pressure to remove debris. The natural gas and debris were subsequently vented into a congested area where the natural gas accumulated and found an ignition source. The resulting explosion killed six people and injured at least 50.

CSB’s investigation concluded that the venting of natural gas in this manner is inherently unsafe because of the intrinsic fire and explosion hazards. The CSB also concluded that alternative pipe-cleaning methods, such as pigging or blowing with air, are available and feasible to accomplish the same cleaning function.

The CSB estimates that approximately 125 power plants will commission new natural gas-fueled combustion turbines between 2010 and 2015, and about half of these facilities have already identified the manufacturers from whom they will purchase turbines. Those manufacturers are General Electric, Siemens, Solar Turbines, Inc., Mitsubishi Power Systems, Pratt & Whitney, and Rolls-Royce. The CSB issued recommendations to these six turbine manufacturers to (1) warn their customers of the dangers of fuel gas to clean piping and provide guidance on safer, alternative cleaning methodologies, and (2) to

collaborate with the Electric Power Research Institute (EPRI) to publish technical guidance on safe pipe cleaning methodologies.

B. Response to the Recommendation

Solar Turbines, Inc., issued a Product Information Letter (PIL) to all owners of any Solar equipment linking to EPRI's "Guidelines for Fuel Gas Line Cleaning Using Compressed Air or Nitrogen" developed as a result of CSB recommendations from the Kleen Energy investigation. The PIL provides technical guidance on inherently safer methods for cleaning fuel gas piping and strongly warns against the use of gas blows for pipe cleaning.

C. Board Analysis and Decision

As Solar Turbines, Inc., has developed technical guidance on inherently safer methods for cleaning fuel gas piping with language banning the use of combustible gas for pipe cleaning inside the United States, and has made this guidance available to all its customers, the Board voted to change the status of CSB Recommendation No. 2010-07-I-CT-UR6 to: **"Closed-Acceptable Action."**