

STEP Combustion CASE STUDY

Resonant Vibration of an Oil Fired Industrial Air Heater

Problem:

A mineral supplier with an industrial air heater used for spray drying was experiencing problematic vibration. After unsuccessful attempts to eliminate the vibration through tuning and OEM recommended changes, the customer contacted STEP for an onsite evaluation.

Unit Description: Air-atomized, light-oil fired, air heater equipped with a single PCC burner having a burner heat input of 24 MMBtu/hr.

Solution:

STEP performed an onsite evaluation and diagnostic testing to determine potential sources of vibration. Flow and combustion sources of vibration as well as historical information were examined, through which, STEP was able to determine that the vibrations were flame induced. [Flame induced vibration occurs when the frequency of the flame front shifting matches the resonant frequency of the structure causing a frequency amplification and the associated vibration.]

In order to eliminate the resonant vibrations, STEP designed and supplied a new oil burner configuration which would provide a higher flame frequency.

Results:

Within four (4) weeks, STEP designed, and manufactured redesigned combustion hardware for the air heater. The hardware was installed, the unit started, and operated through the load range. Operating settings were tuned throughout the load range, and it was confirmed that the vibrations had been eliminated.



Figure 1 - Original Burner Configuration

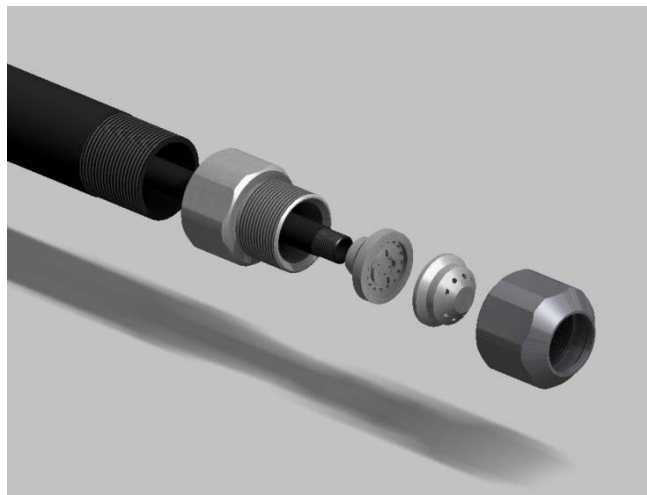


Figure 2 - STEP Light Oil Atomizer