

106th Meeting of the Galvanizers Association 2014
Jackson, Mississippi

Factors, Influencing Radiant Tube Life

Joachim G. Wuenning

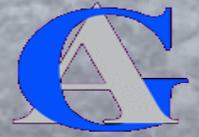
WS Inc. • 8301 West Erie Ave. • Lorain, Ohio 44053

Tel. +1 (440) 385 6829 • Fax +1 (440) 960 5454

E-mail: WSInc@FLOX.com • Internet: www.FLOX.com



topics



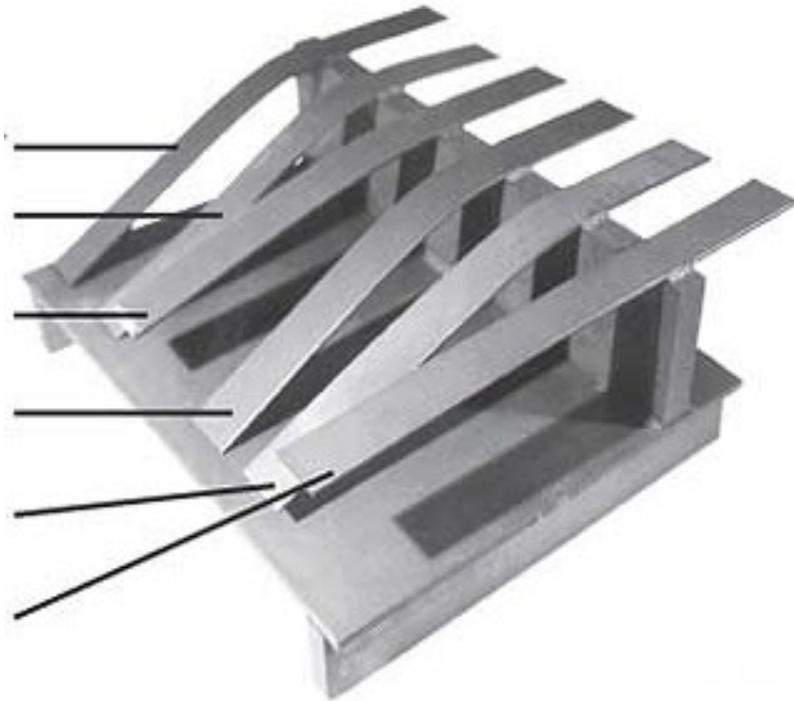
Jackson, MS • 2014

- tube design
 - material
 - structural design
 - workmanship
- operation
 - production rate
 - burner control and design
 - furnace control
- maintenance

creep strength



Jackson, MS • 2014



100 hrs at 2000°F

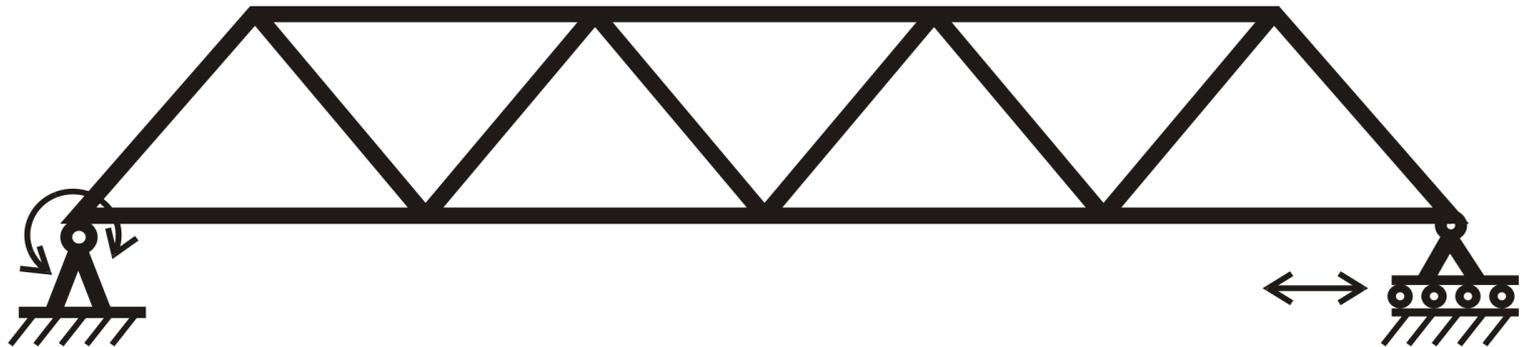
source: Haynes



32 hrs at 1800°F

source: Rolled Alloys

structure for stiffness



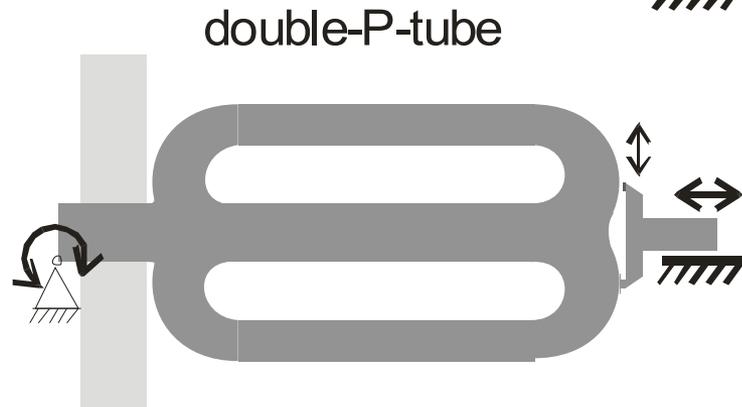
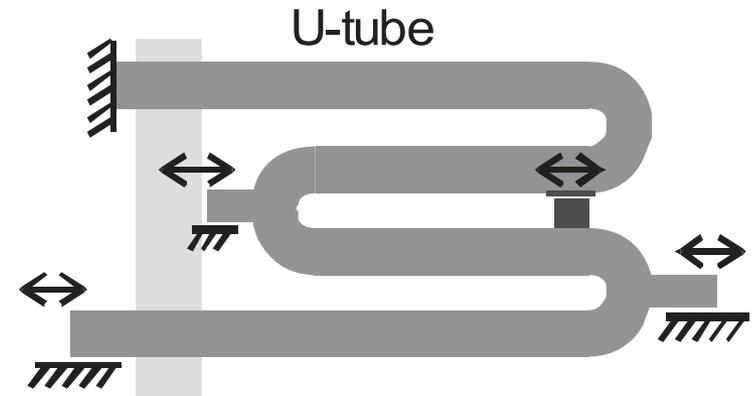
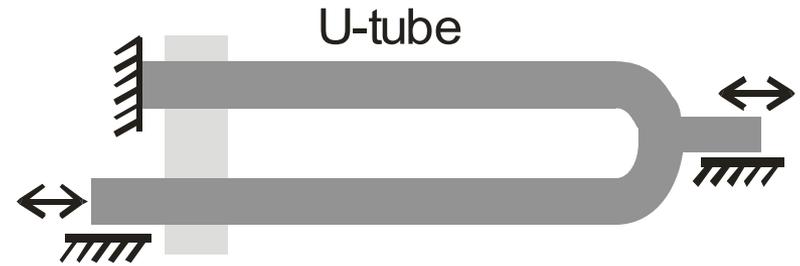
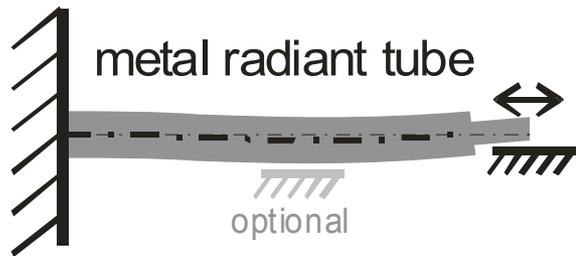
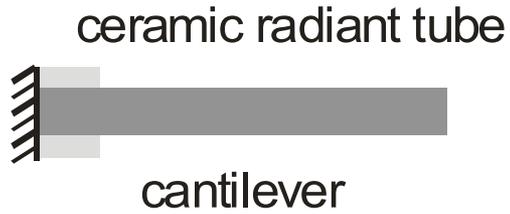
pinned support

roller support

structural design



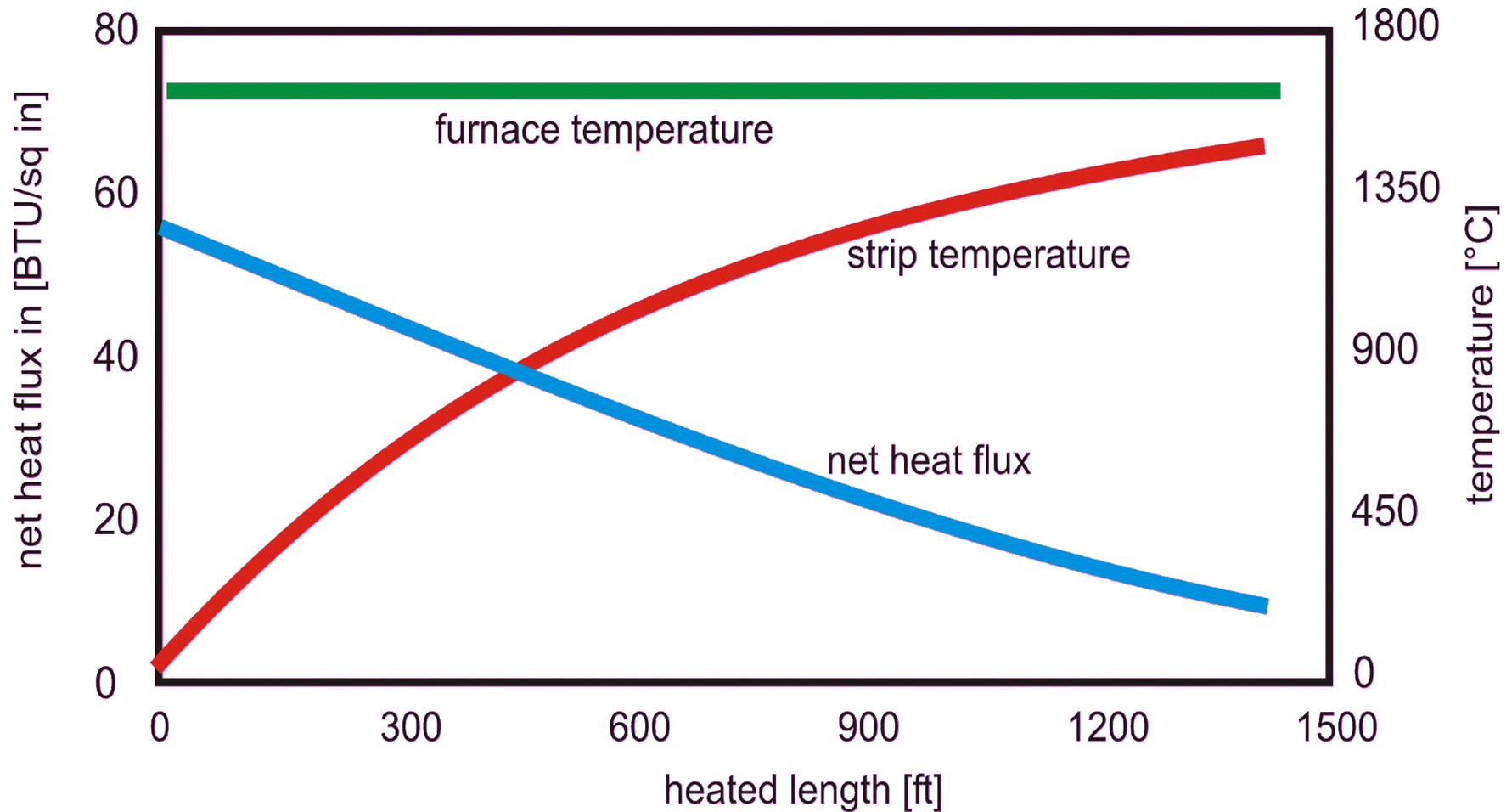
Jackson, MS • 2014



ideal heating process



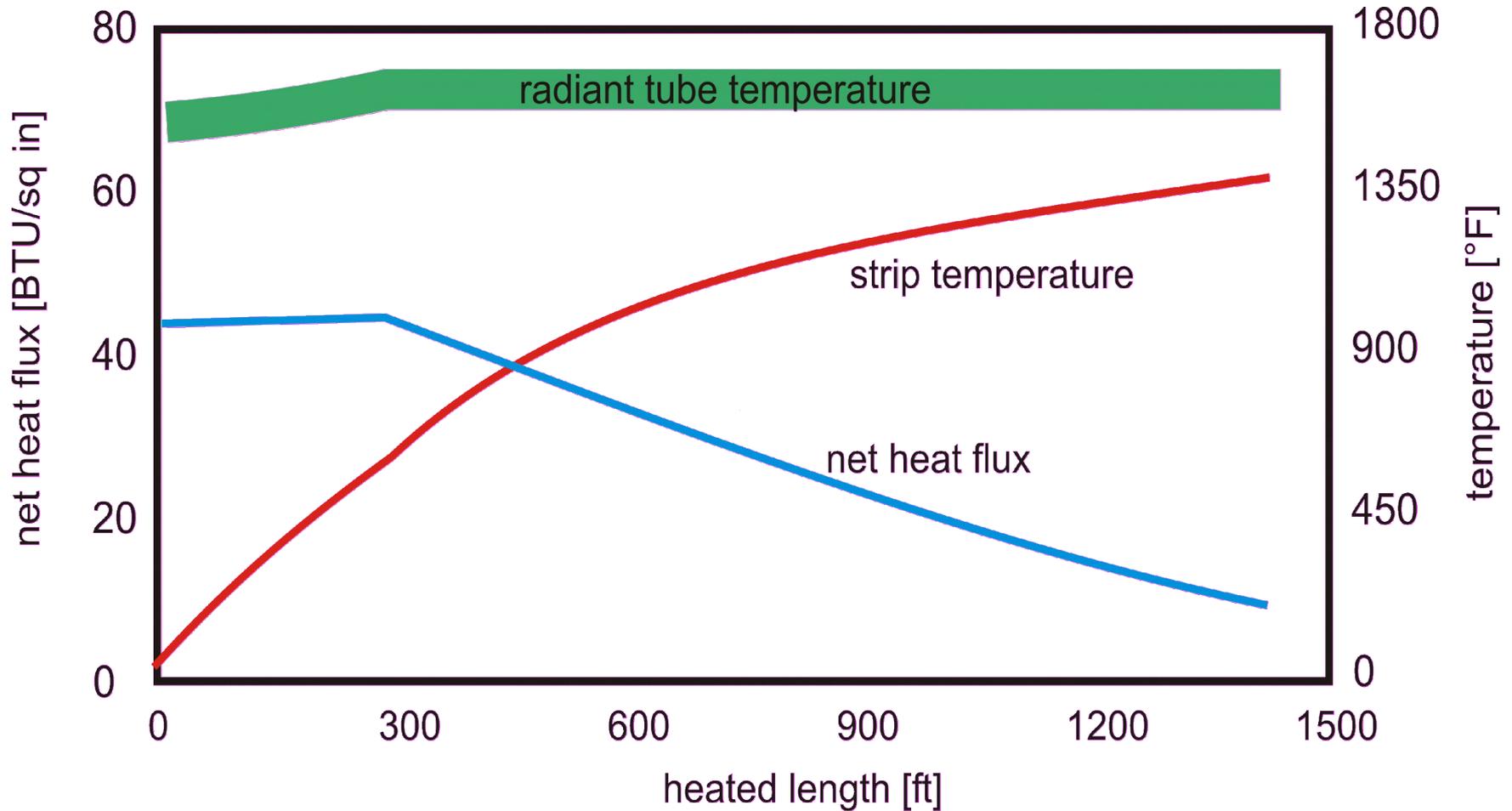
Jackson, MS • 2014



furnace control



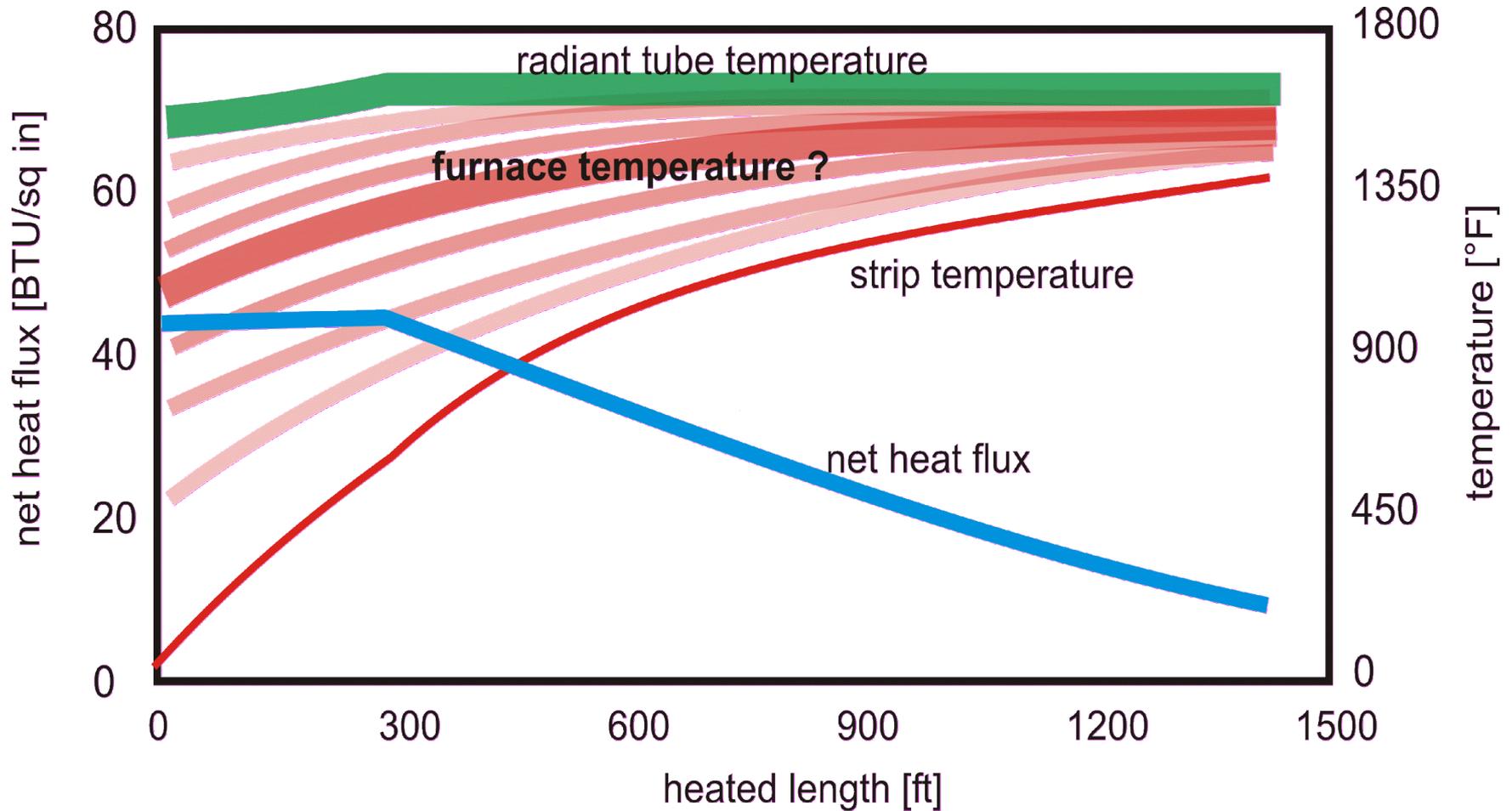
Jackson, MS • 2014



furnace control



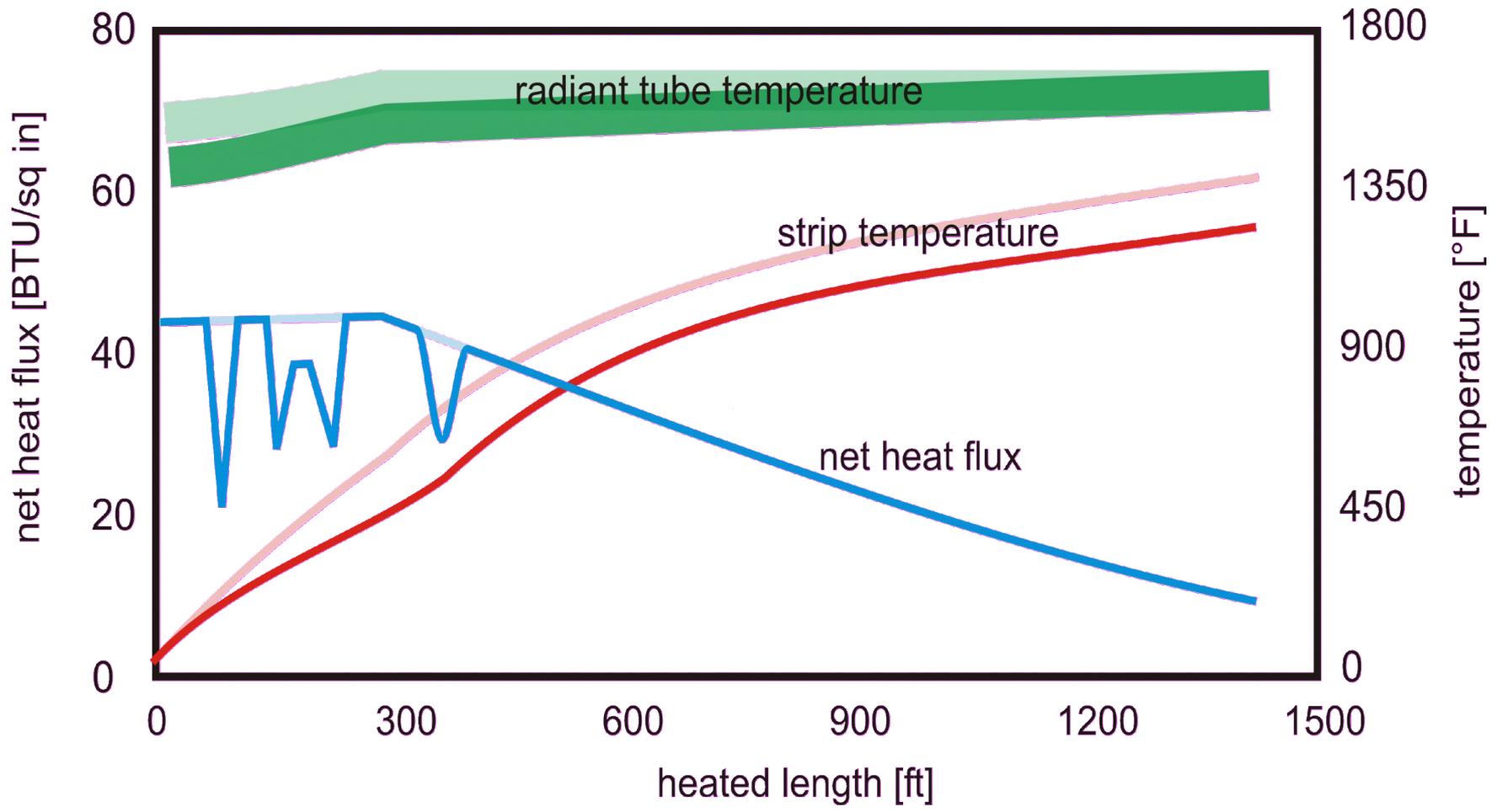
Jackson, MS • 2014



real process



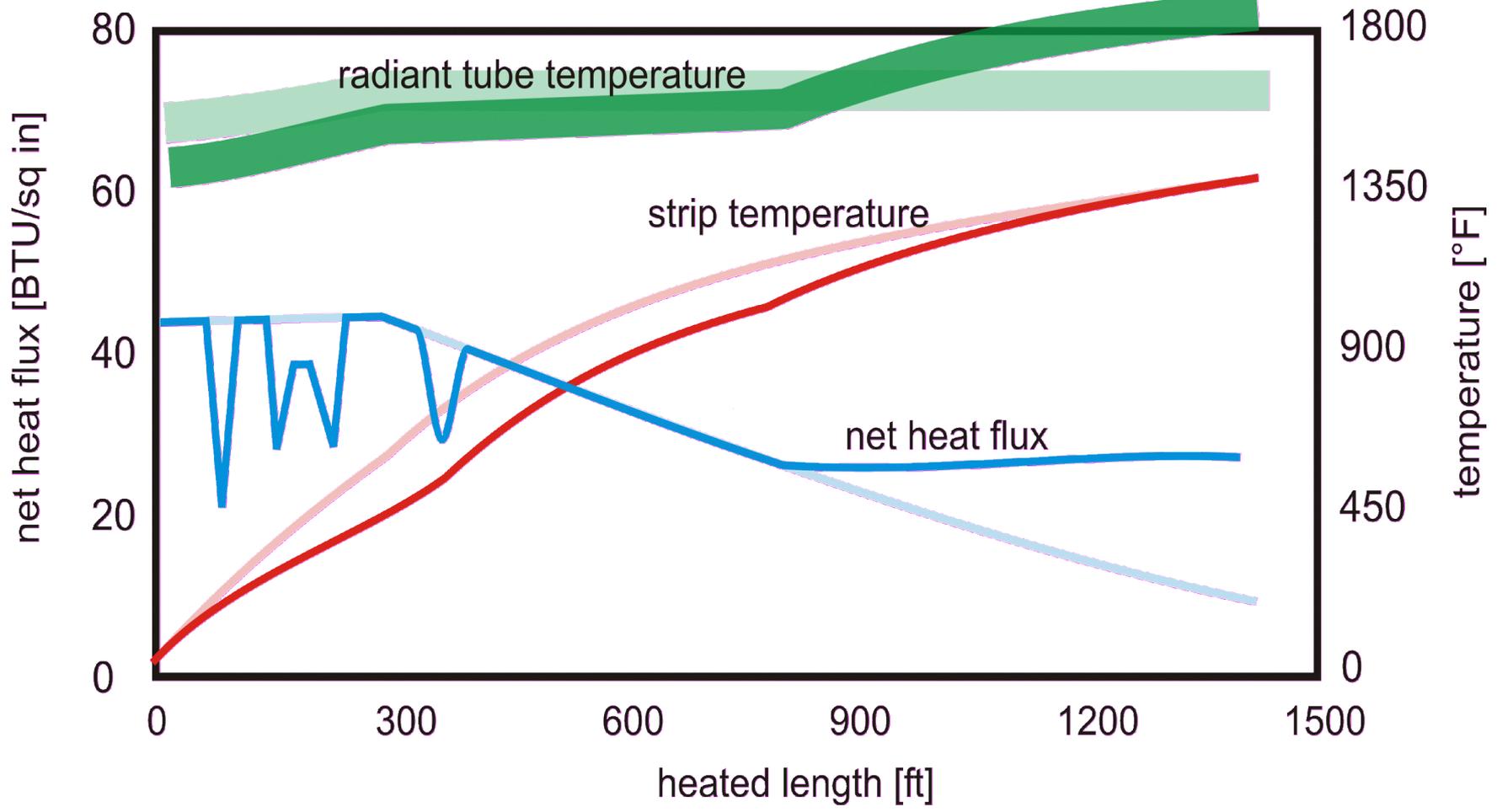
Jackson, MS • 2014



real process



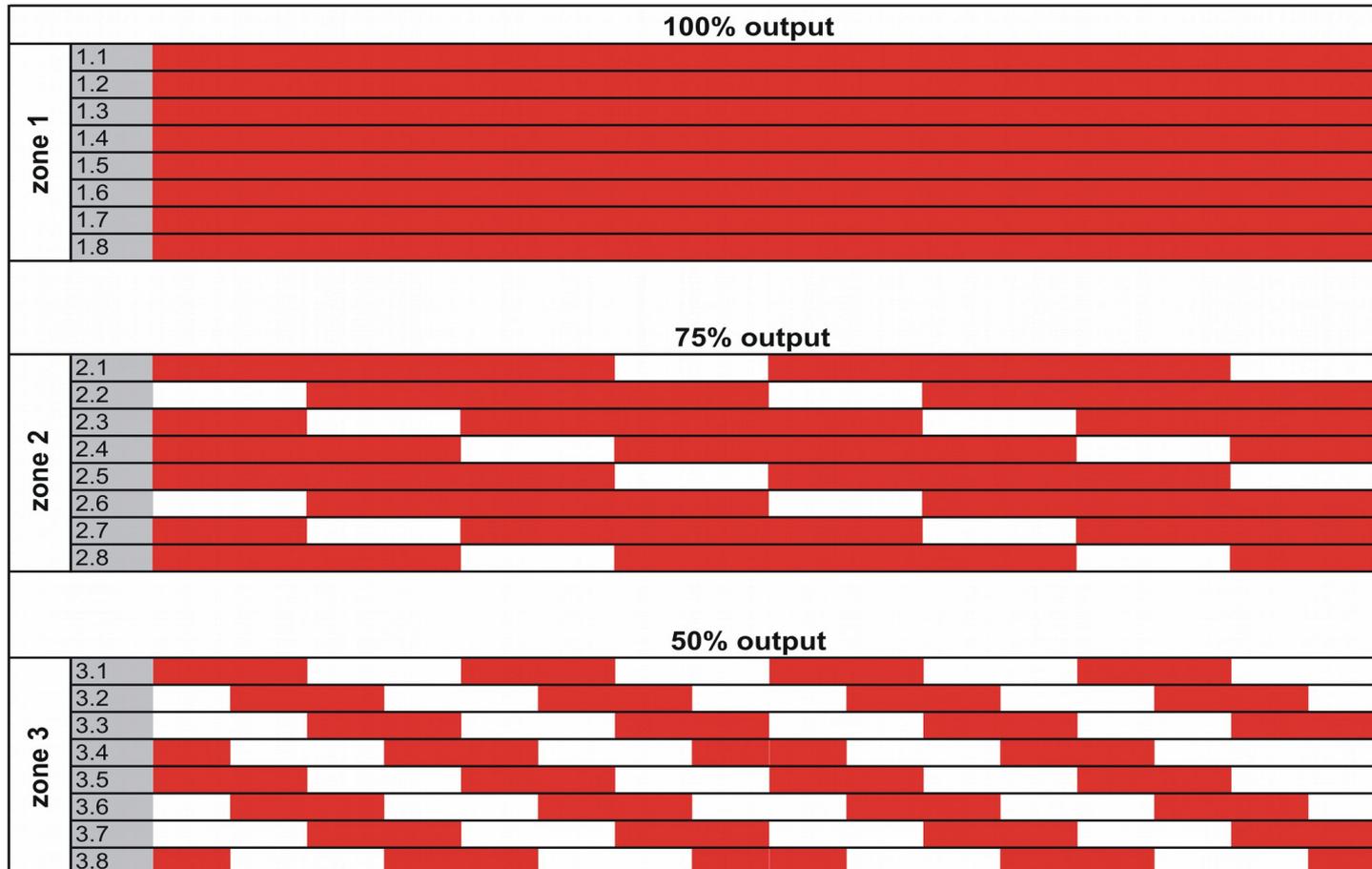
Jackson, MS • 2014



burner control, pulse firing



Jackson, MS • 2014



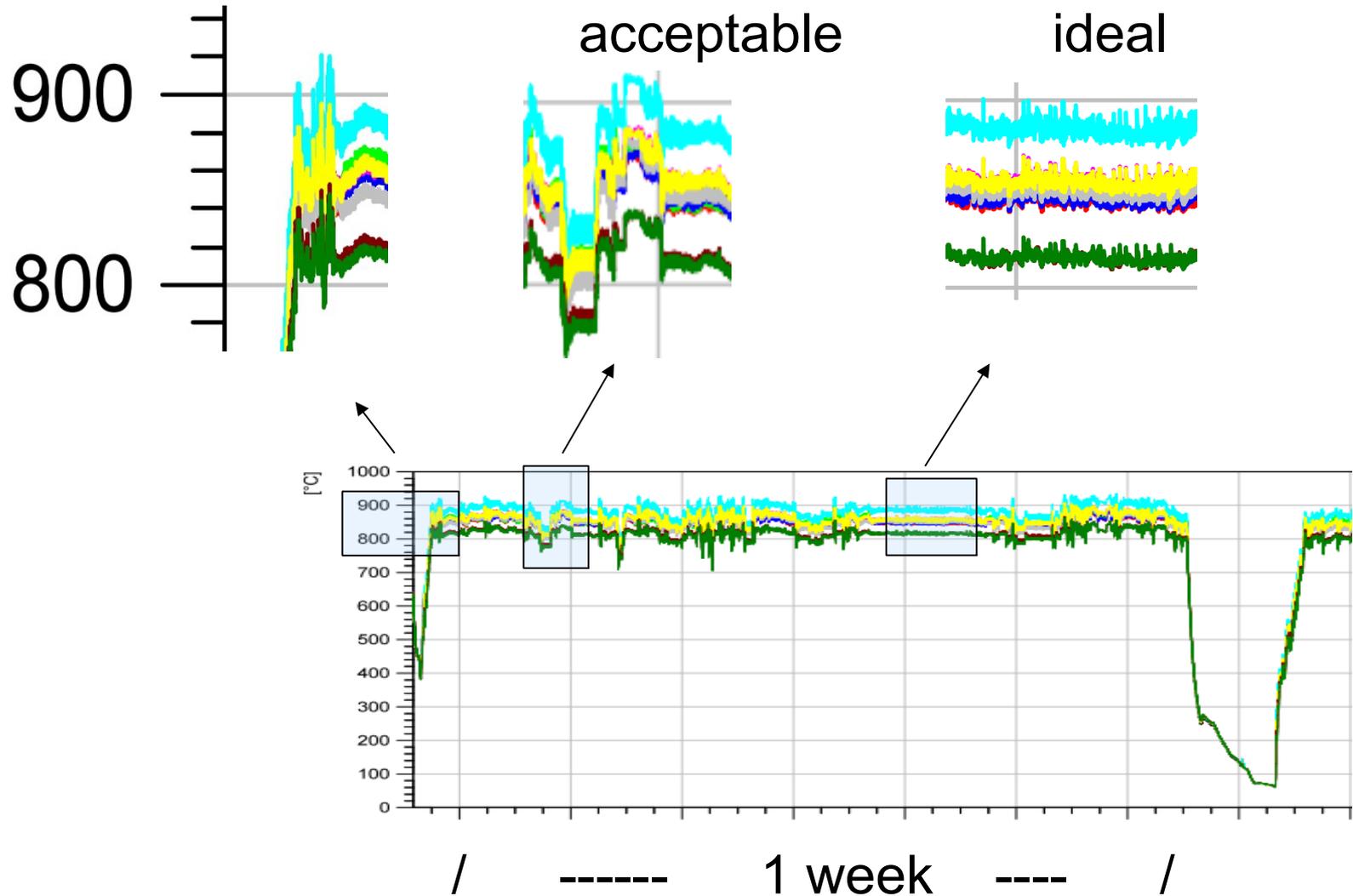
time →

burner on
burner off

control



Jackson, MS • 2014



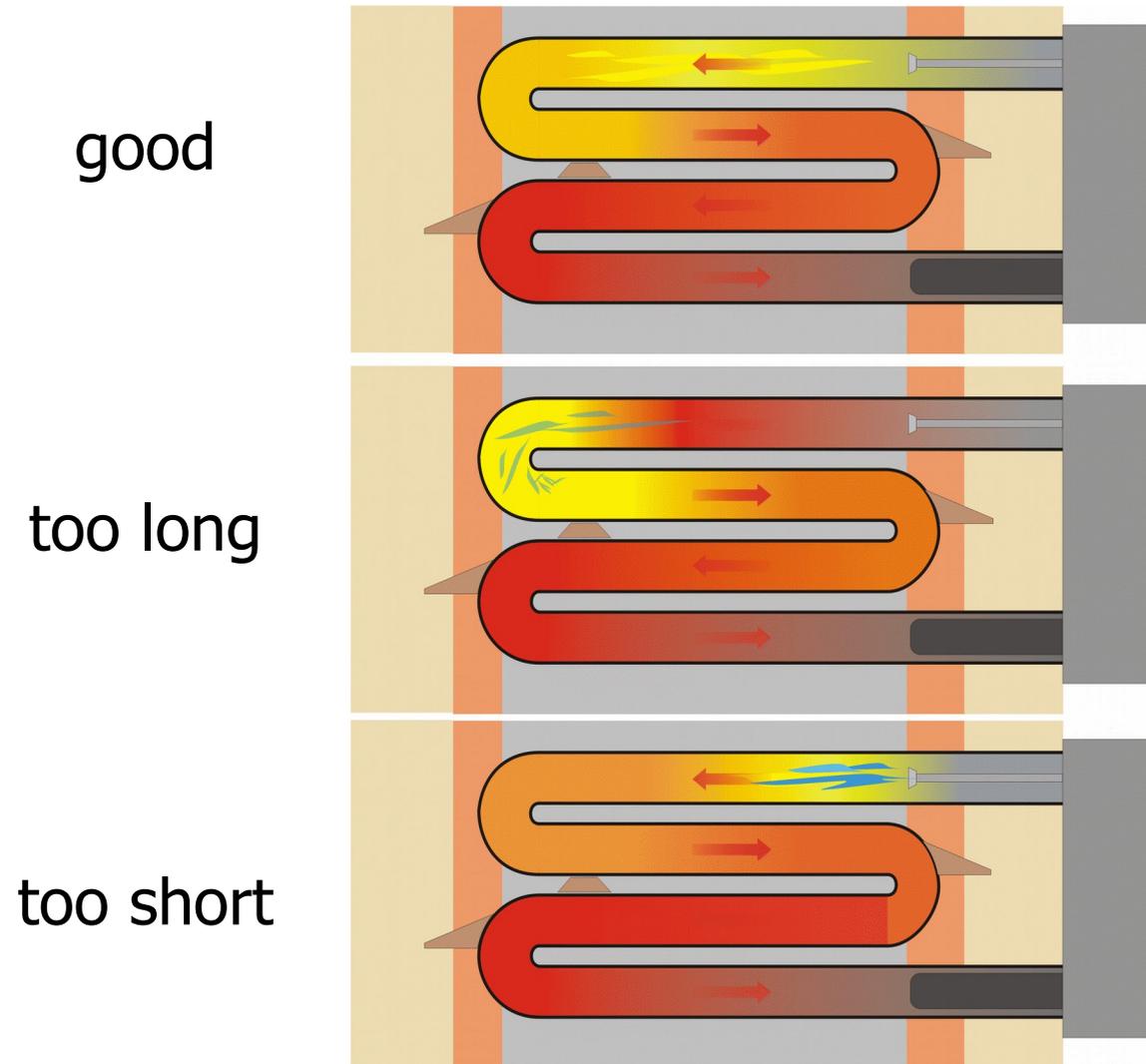


- temperature variations from proper burner on/off control (pulse firing) are generally much smaller than variation originating from the furnace control
- using the safety shut off (radiant tube over-temperature) is by **no** means intended to be used as a controlling the heat input into the furnace
- the heat flux profile is valuable information
- heat flux (heat output / strip width) should decrease when the strip gets hotter
- heat flux and temperatures should not fluctuate more than required (strip parameter changes)

burner design, flame length



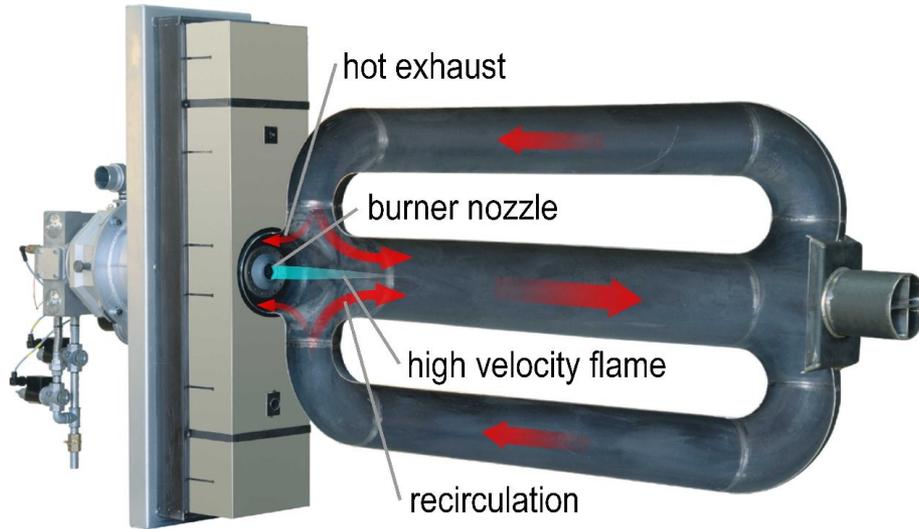
Jackson, MS • 2014



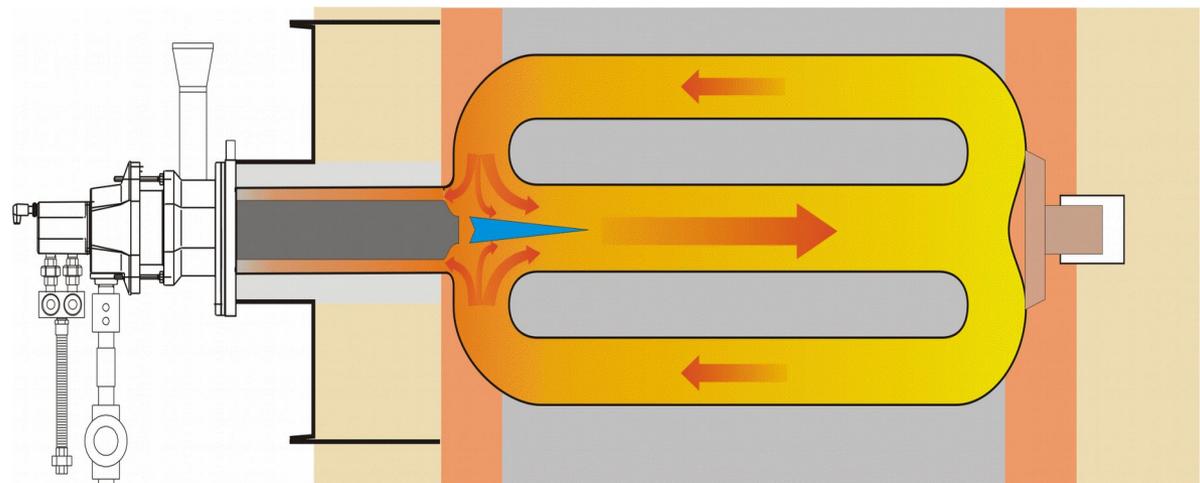
burner design, high recirculation



Jackson, MS • 2014



high recirculation requires high velocity burner and on / off control





- proper maintenance helps to detect small defects before they become large problems
- proper maintenance provides the data to understand your equipment and process
- proper maintenance keeps the burners tuned, efficient and clean

conclusions



Jackson, MS • 2014

- tube life can be affected by many factors
- watch the heat flux profile
- analyze tube failures
- suppliers and users should work together (not blame each other)