An aerial photograph of an industrial facility, likely a power plant or refinery, featuring several large, light-colored buildings and a network of pipes. The facility is surrounded by greenery and residential areas in the background. The text is overlaid on the center of the image.

# **Hazard mitigation in fuel system design**

**Stacy Cook**

**General Manager and VP of Operations  
at Koda Energy LLC**

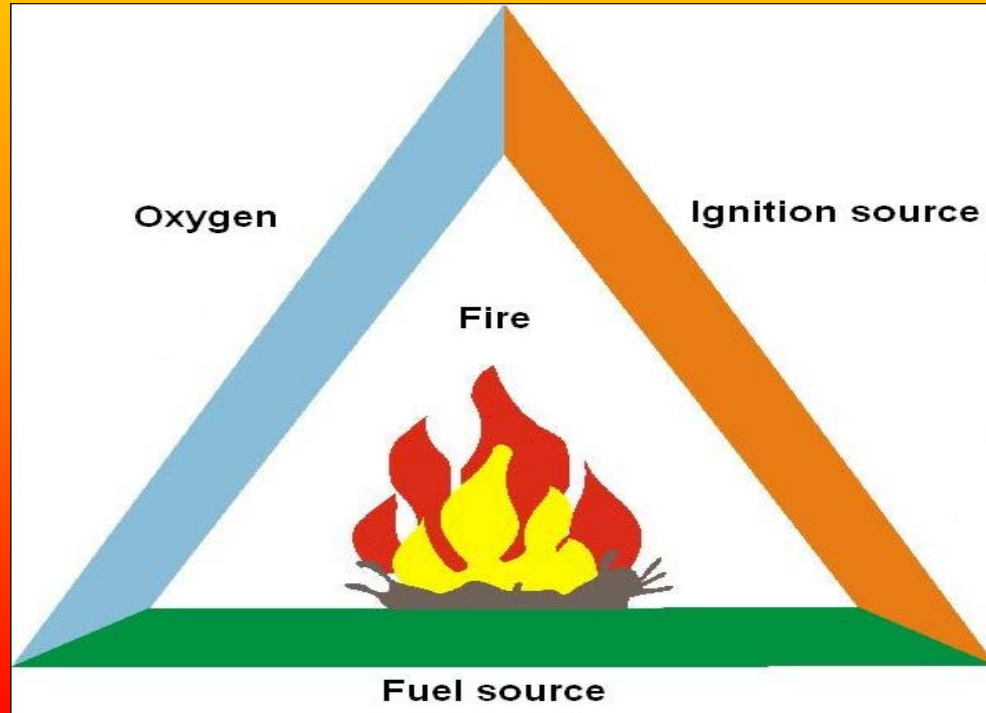
# A little about Koda Energy

- Koda Energy is a combined heat and power facility that runs on biomass fuel.
- Koda produces ~500 megawatt hours/ day of electricity.
- Koda produces ~ 2400 mmbtu/day of thermal energy.
- Between 8,000 and 9,000 semi-trailers of biomass fuel moves through the facility every year.
- Our fuel consists of wood chips, sawdust, elevator dust and chaff, and grain hull material.
- Our electrical output powers Koda and Rahr malting, the excess is sold to Xcel Energy.
- The thermal energy we produce is sold one of Rahr's malt production facilities ( the largest single site malting facility in the world ).

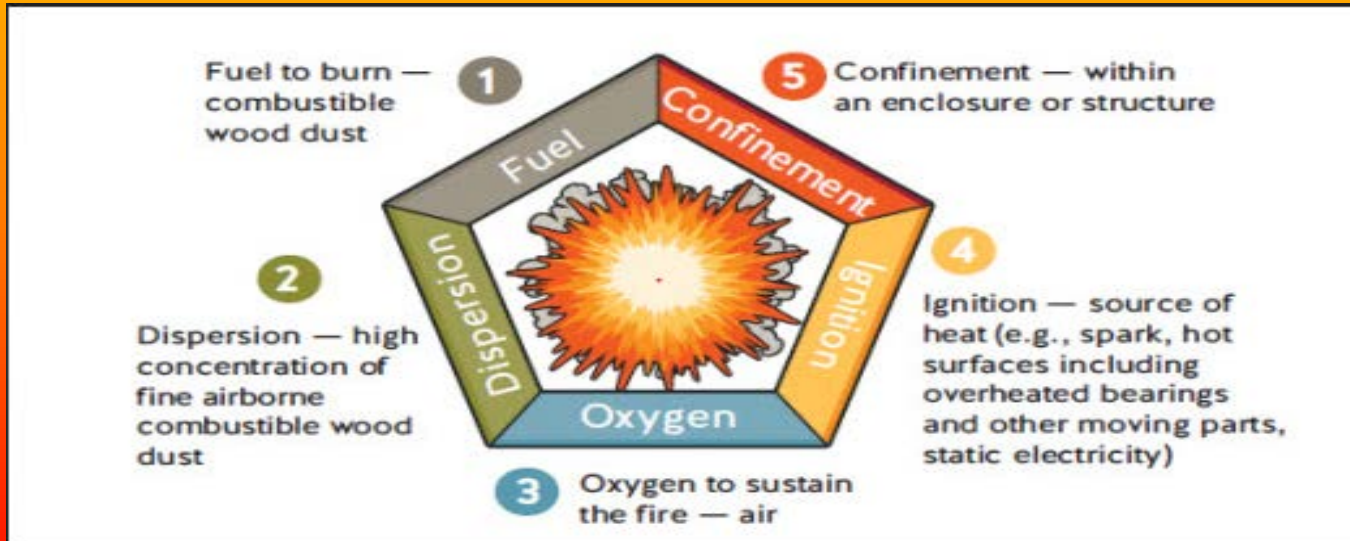
**Koda as commissioned in May of 2009**



# The fire triangle



# The explosion pentagon



The afternoon of April 25<sup>th</sup> 2013



# The location of the initial deflagration/explosion





Reduced dust creation by limiting drop height



Point and area dust collection

Velocities 2500 -4500 fpm

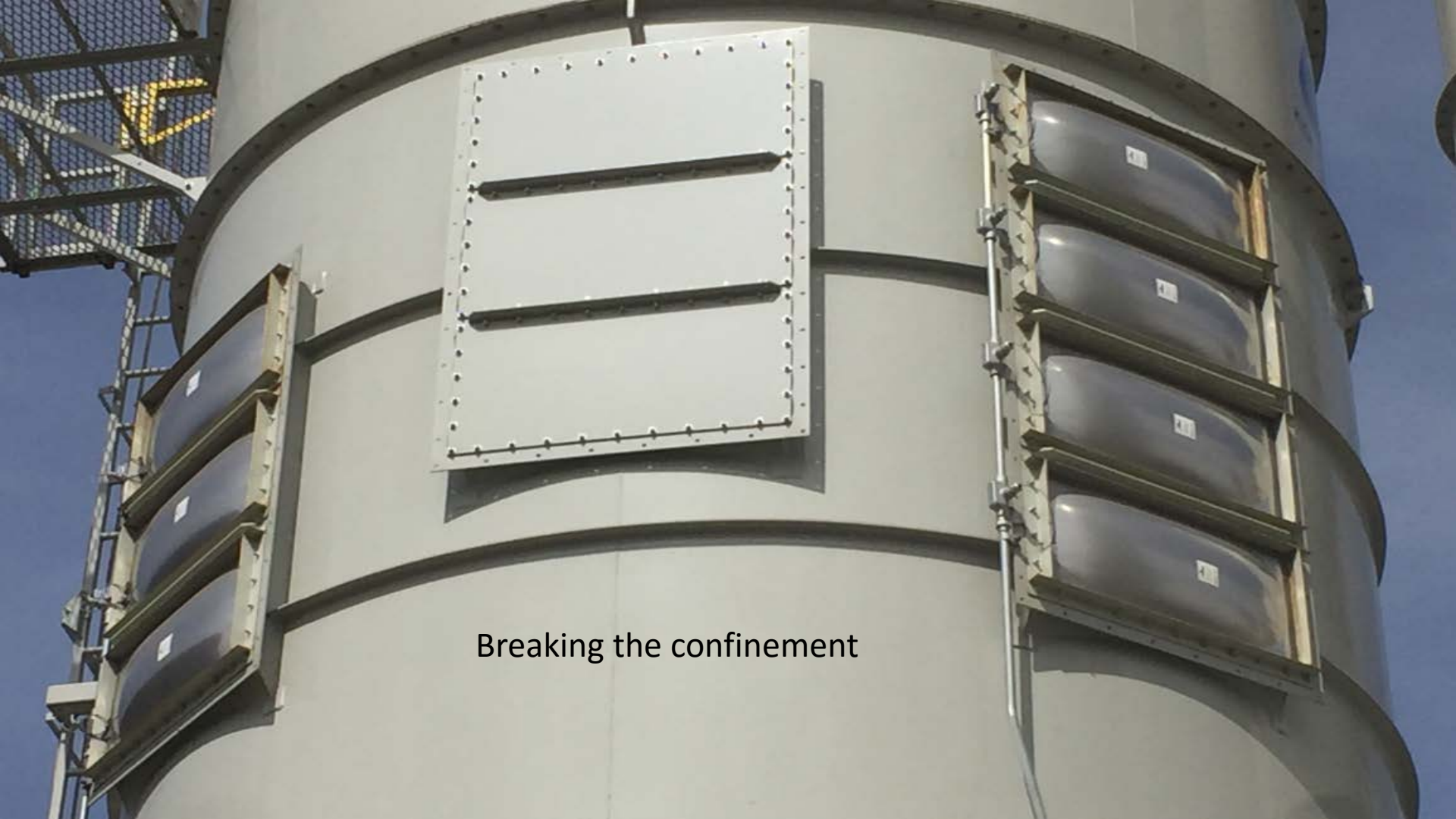




Point collection and removal of dust



Reducing drop heights, to limit  
Particle segregation and suspension



Breaking the confinement



Pressure release panels  
To break confinement

Mechanical friction




Adequate grounding to  
Prevent static discharge





Class 2 division 1 or  
Class 2 division 2





Isolating an event  
Mechanically

Chemical isolation





Sensing and control  
System isolations

Sensing and extinguishment





GRECON SYSTEM #1

GRECON SYSTEM #2

GRINDER EMERGENCY DELUGE SYSTEM



# Thermal imaging



Temperature scale legend with values: 99.8, 97.1, 94.4, 91.7, 89.0, 86.5, 83.8, 80.9, 78.2, 75.5, 72.8.

Auto Gain  Invert Palette

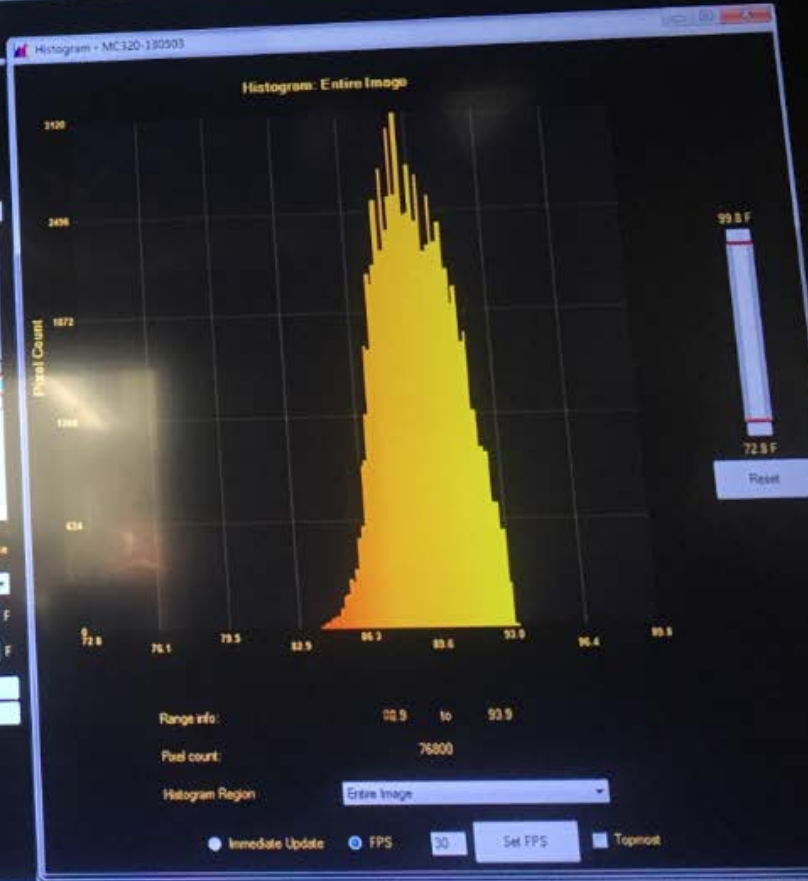
Entire Image

Max: 99.8 93.4 72.8 F

Min: 72.8 80.6 72.8 F

Default

Default





Field verification



FLIR

# **All facilities are different, and need their own strategies, suited to their purpose and function**

- **Maintain written documentation of the equipment design**
- **Management of change program**
- **Perform a process hazard analysis, update when changes are made**
- **Implement a written ignition control program**
- **Employee training**
- **Written operating and maintenance procedures**
- **Inspection, testing, and maintenance program**
- **Written housekeeping and combustible dust training program.**
- **Use NFPA 61, 68, 69, 664, and 654 for additional guidance**





KSC  
KSCA  
KSCB