Process Burner Flames: Good, Bad & Ugly

Chuck Baukal
Director, JZ Institute
918.234.2854
charles.baukal@johnzink.com

Doug Basquez
Energy Coordinator
316.321.8387
douglas.basquez@hollyfrontier.com

Mike Pappe
End User Sales & Service
661.588.5095
mike.pappe@johnzink.com

John McGuire
End User Sales & Service
713.443.1078
john.mcguire@johnzink.com

Bill Johnson
Aftermarket Support
918.234.5742
bill.johnson@johnzink.com

Bill Weimer
End User Sales & Service
985.288.5551
william.weimer@johnzink.com

Robert Luginbill
End User Sales & Service
918.234.1825
robert.luginbill@johnzink.com
Important Notice

The information contained in these materials is for informational purposes only and is provided “AS IS”, without warranties of any kind. Your use of the information contained herein is at your sole risk. We expressly disclaim any express or implied representations, warranties or guaranties, including without limitation, the implied warranties of merchantability and fitness for a particular purpose. We will have absolutely no liability (whether direct, indirect or consequential) in connection with these materials (and/or the information contained therein) including without limitation, any liability for damage to person or property. We also reserve the right to make subsequent changes to the materials without prior notice. For purposes of this notification, “We” includes John Zink Company LLC and its affiliates and their respective employees, partners, principles, agents and representatives, and any third-party providers or sources of information or data.

This presentation is subject to copyright and the information presented is confidential and/or proprietary to John Zink Company, LLC. Accessing, using, copying, and/or changing the presentation or any part thereof is strictly prohibited.

For more information on patents and trademarks, see johnzinkhamworthy.com/legal-notices

©2018 John Zink Company, LLC
Outline

• Introduction
• Good Flames
• Bad Flames
• Ugly Flames
• Summary & Recommendations
Introduction

• JZHC field personnel inspect thousands of burners each year & find a wide range of flame conditions:
  • Good – no changes needed
  • Bad – changes needed but likely not dangerous
  • Ugly – immediate changes needed, potentially dangerous
Outline

• Introduction
• **Good Flames**
  • Bad Flames
  • Ugly Flames
  • Summary & Recommendations
**Good Flames – no changes needed**

- Principles of good burner operation:
  - Uniform flames
  - Proper flame color
  - No significant hot spots or dark spots on burner tiles
  - Flames not leaning into each other or into process tubes
  - Flames are stable
- It’s not a beauty contest – not looking for perfection
Photos of Good Flames
Videos of Good Flames
Outline

• Introduction
• Good Flames
• **Bad Flames**
  • Ugly Flames
• Conclusions & Recommendations
Bad Flames – changes needed, but likely not dangerous

- Examples of bad flames:
  - Non-uniform flames
  - Poor flame patterns
  - Improper flame colors
  - High or low draft
  - Significant hot spots or dark spots on burner tiles
  - Flames leaning into each other (flame-flame interaction)
  - Flames are stable
Non-Uniform Flames

2 air registers closed
Flame Pattern Problems
Plugged Tips
Plugged Tips

Before cleaning

After cleaning
Plugged Staged Tip
Plugged Burners
Draft & O2 Problems

before adjustment
flat flame burners fired horizontally

after adjustment
Fuel Rich vs. Clean Firebox

Heater flooded, fuel rich firebox

Clear firebox, burners adjusted
Fuel Rich vs. Clean Firebox

Flooded heater, hazy firebox

Heater after adjustment
Fuel Rich vs. Clean Firebox

Long tailing cloudy flames, haze visible in the firebox

Clear firebox, no haze
Improper Air Adjustments

Burner short of air, hazy tailing flames

Same burners with proper air adjustments
Air Unbalanced

Primary air door closed
Not Enough Air to 1 Burner
Leaning Flames

Baking soda used to visualize flame
Leaning Flames
Flame-Flame Interaction
Flame Rollover
Outline

• Introduction
• Good Flames
• Bad Flames
• Ugly Flames
• Conclusions & Recommendations
Ugly Flames – immediate changes needed, potentially dangerous

- Possible characteristics of ugly flames
  - Unstable flames
  - Flame impingement (could lead to tube leak/rupture)
  - Flames lifting off or flashing back
Burner Going Unstable
Huffing Burner
Unstable Heater
Flame Impingement
Flame Impingement

Flames into roof tubes

Deposits on tubes
Flame Impingement through Process Tubes

Platformer (flame coming through tubes)
Flame Impingement
Flame Lift-Off
Flame Lift-Off
Flame Lift-Off
Flashback

Some burner tips
flashing back
Flashback

Mixer flashing back
Flashback
Outline

• Introduction
• Good Flames
• Bad Flames
• Ugly Flames

• Summary & Recommendations
Summary

Process burner flames can be:

• Good – no changes needed
• Bad   – changes needed but likely not dangerous
• Ugly  – immediate changes needed, potentially dangerous
Recommendations for Sites/Users:

• Properly install burners
• Operate burners within their design range
• Properly maintain burners
• Inspect burners/heaters regularly
Frequently Inspect Flames

- Uniform flames
- Proper flame color
- Appropriate flame pattern
  - No impingement
  - Not too long or leaning
- No pronounced hot spots or dark spots on burner tiles
- No irregular flame movement (e.g., pulsing)
- No unusual sounds (e.g., flashback)
Thanks for your attention!

Questions or Comments?