

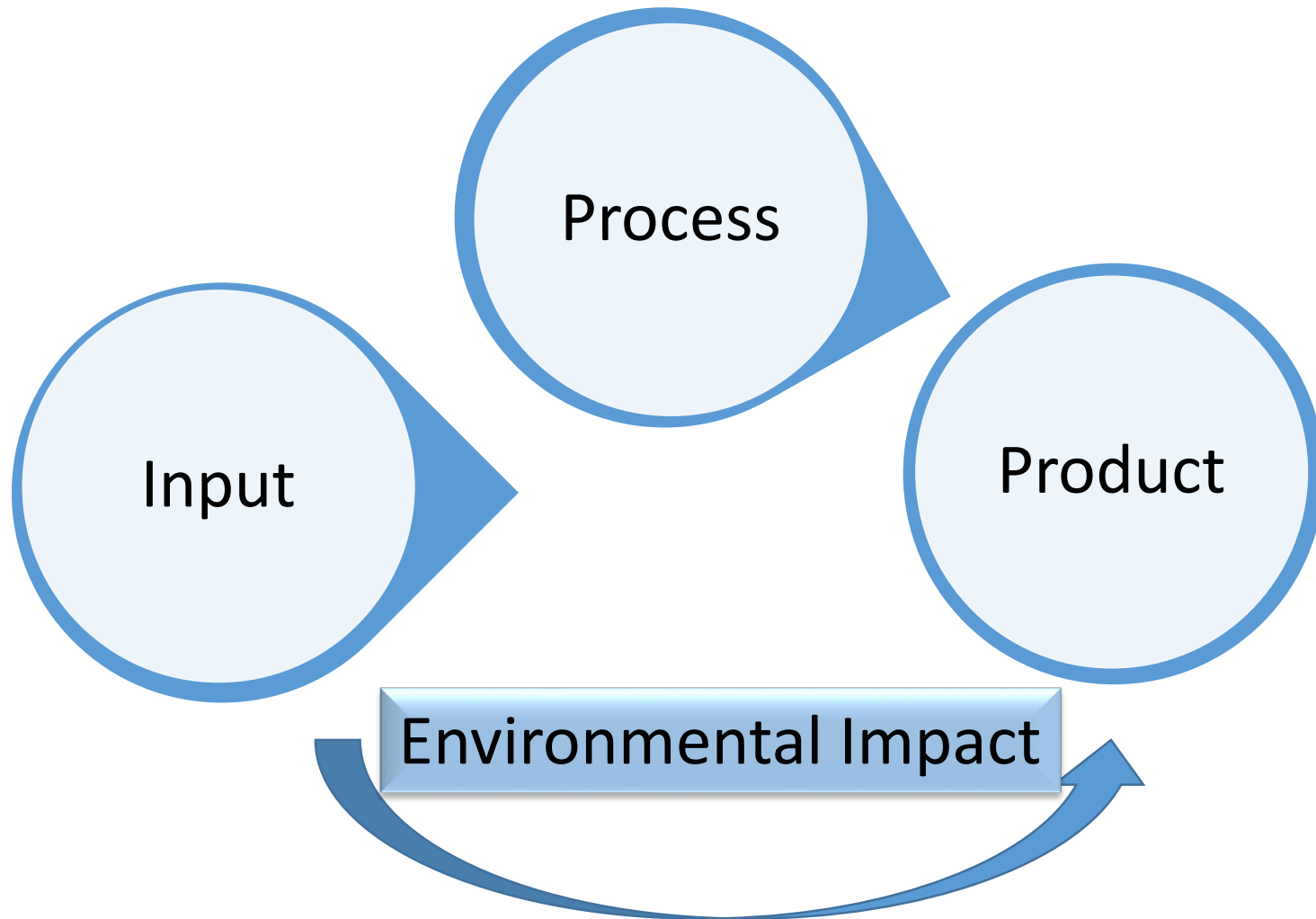
A wide-angle photograph of the Chicago skyline across Lake Michigan. The water is a deep blue-green, and the city's skyscrapers, including the Willis Tower, are visible under a clear blue sky with some light clouds. A semi-transparent white circle is overlaid on the right side of the image, containing the title and date.

Advanced Monitoring Technologies - Benefits & Best Practices

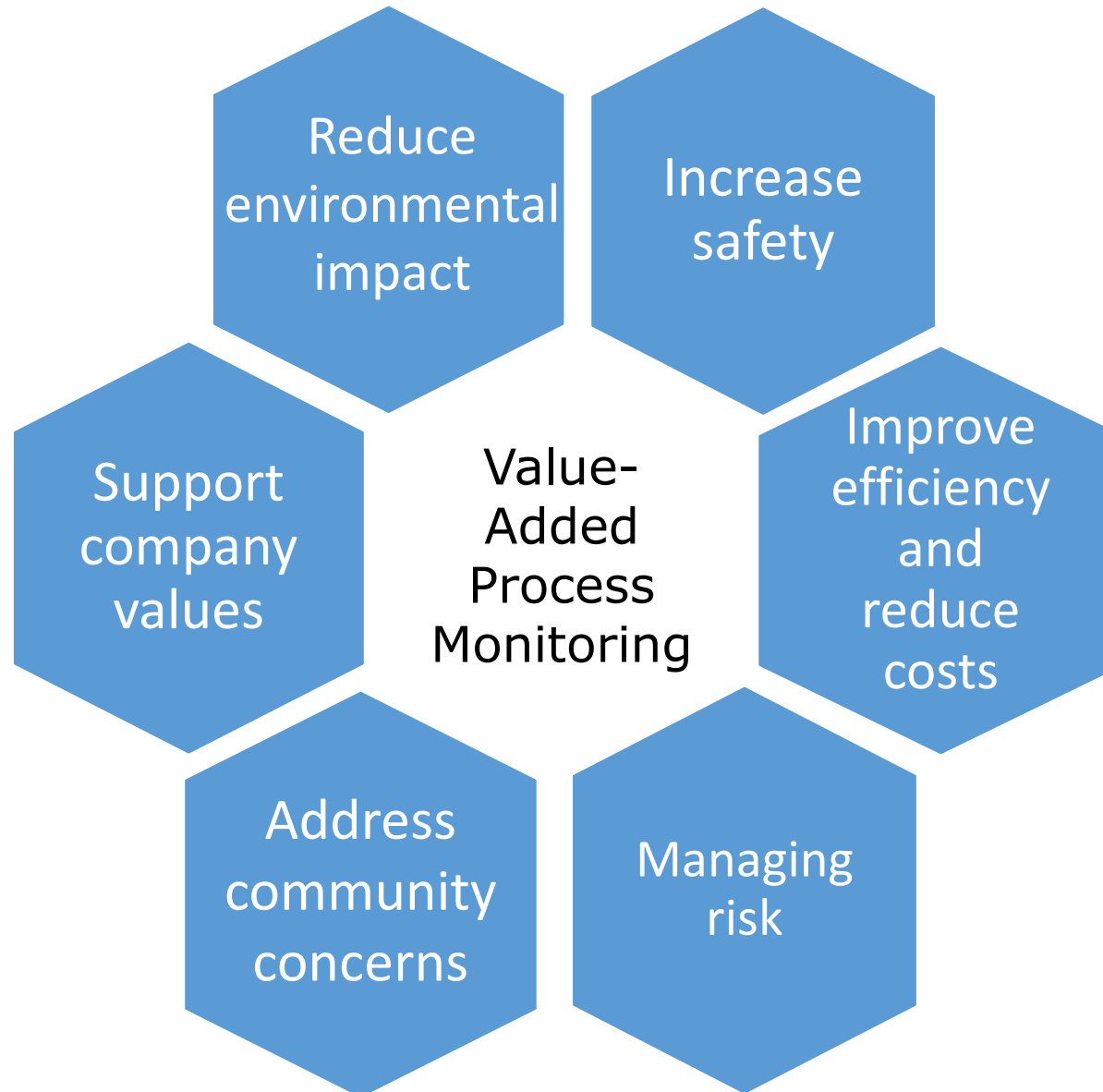
Region V ARD
June 20, 2018



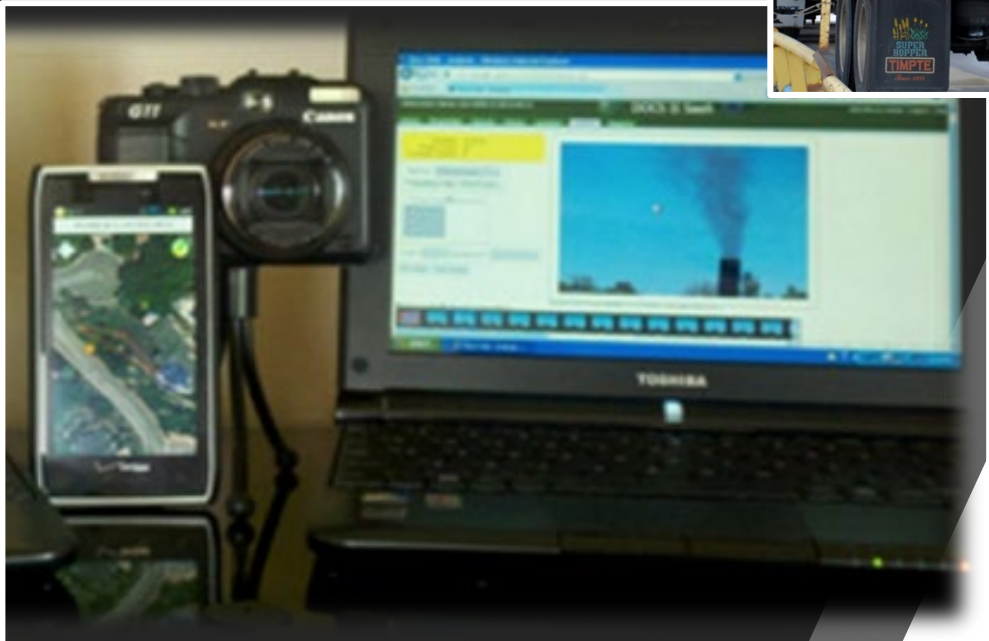
It's all about the Process



Value-Added Process Monitoring



Overview



Monitoring techniques discussed:

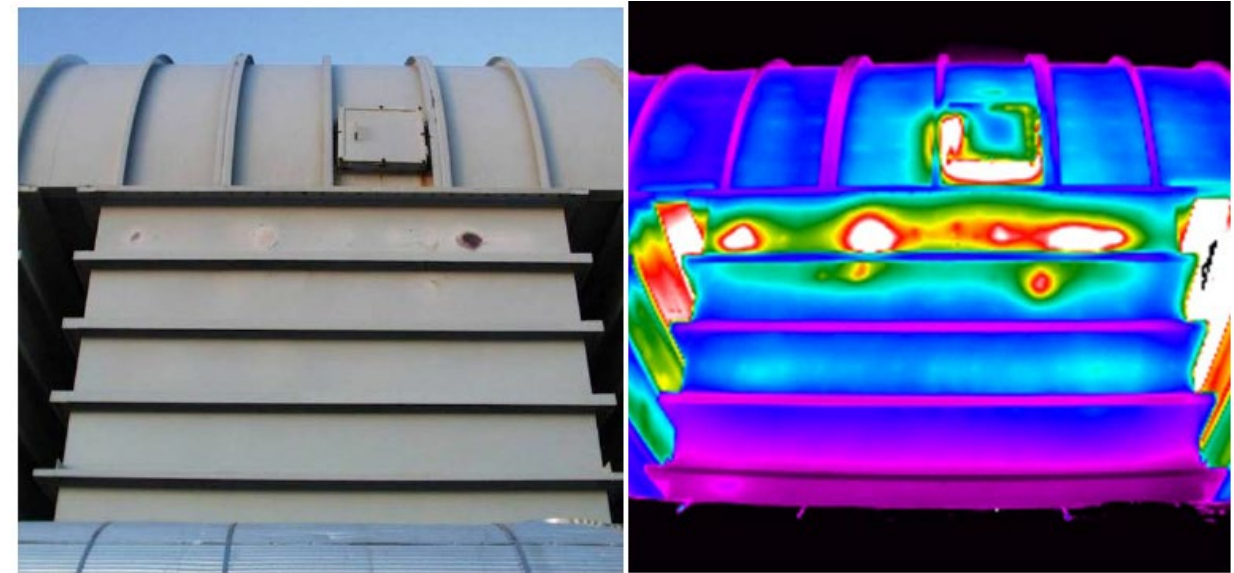
- Infrared cameras
- Digital cameras for opacity measurement
- Effective fugitive dust control plans

- How are these techniques incorporated into air permitting regulations?
- Other (non-regulatory) uses for pollution prevention / reduction

Infrared Thermal Imaging Cameras

Infrared Thermal Imaging Cameras

- Real-time visualization of a portion of the infrared spectrum to “see” radiated heat
- Mechanical and electrical equipment inspection
- Predictive maintenance programs / early fault detection
- Identify safety hazards



Thermographic images of a regenerative thermal oxidizer with refractory lining deterioration. Courtesy: Infrared Cameras Inc.

Optical Gas Imaging Cameras

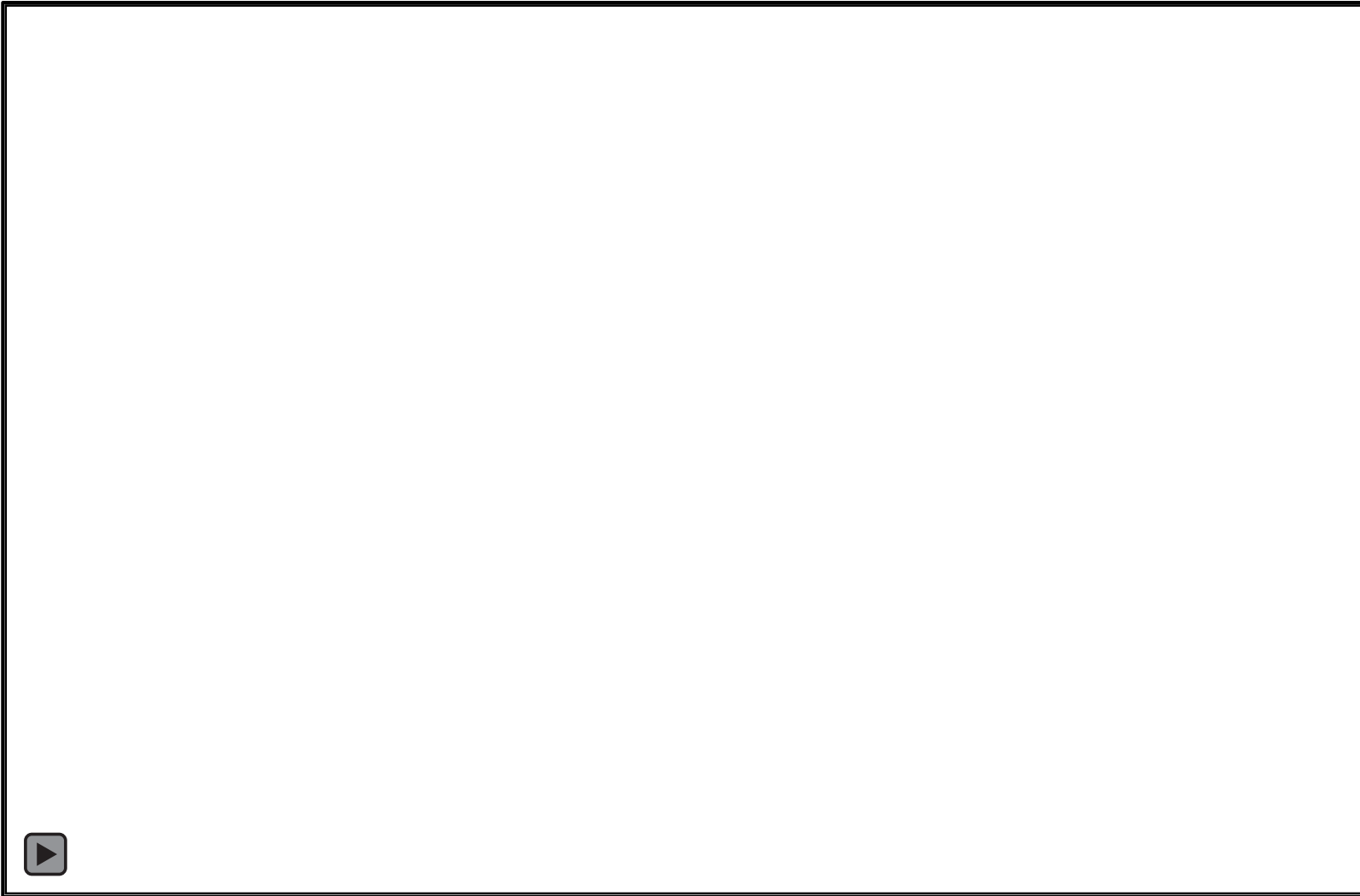
Optical Gas Imaging (OGI)

- Real-time visualization of a portion of the infrared spectrum to “see” selected gases
- Effective for leak detection
- Faster detection, faster repair, minimizes environmental impact
- Cost savings from reducing lost product



*Inspecting pipes for leaks using an OGI camera (top);
Manual leak detection (EPA Method 21) using a VOC detector
probe (bottom)*

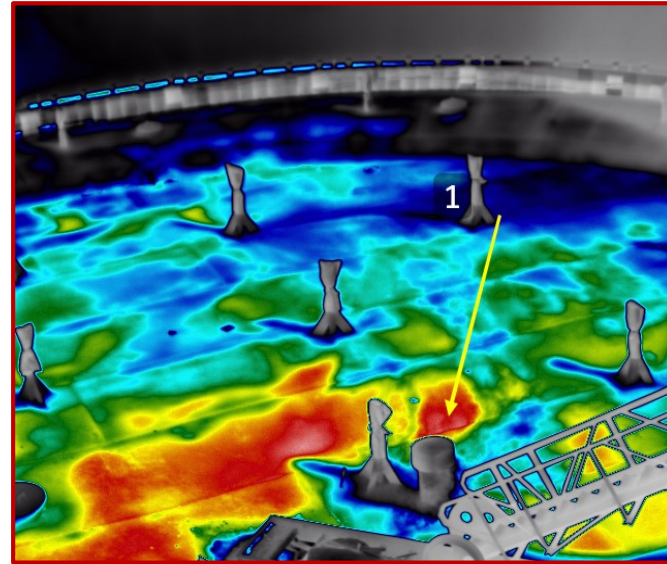
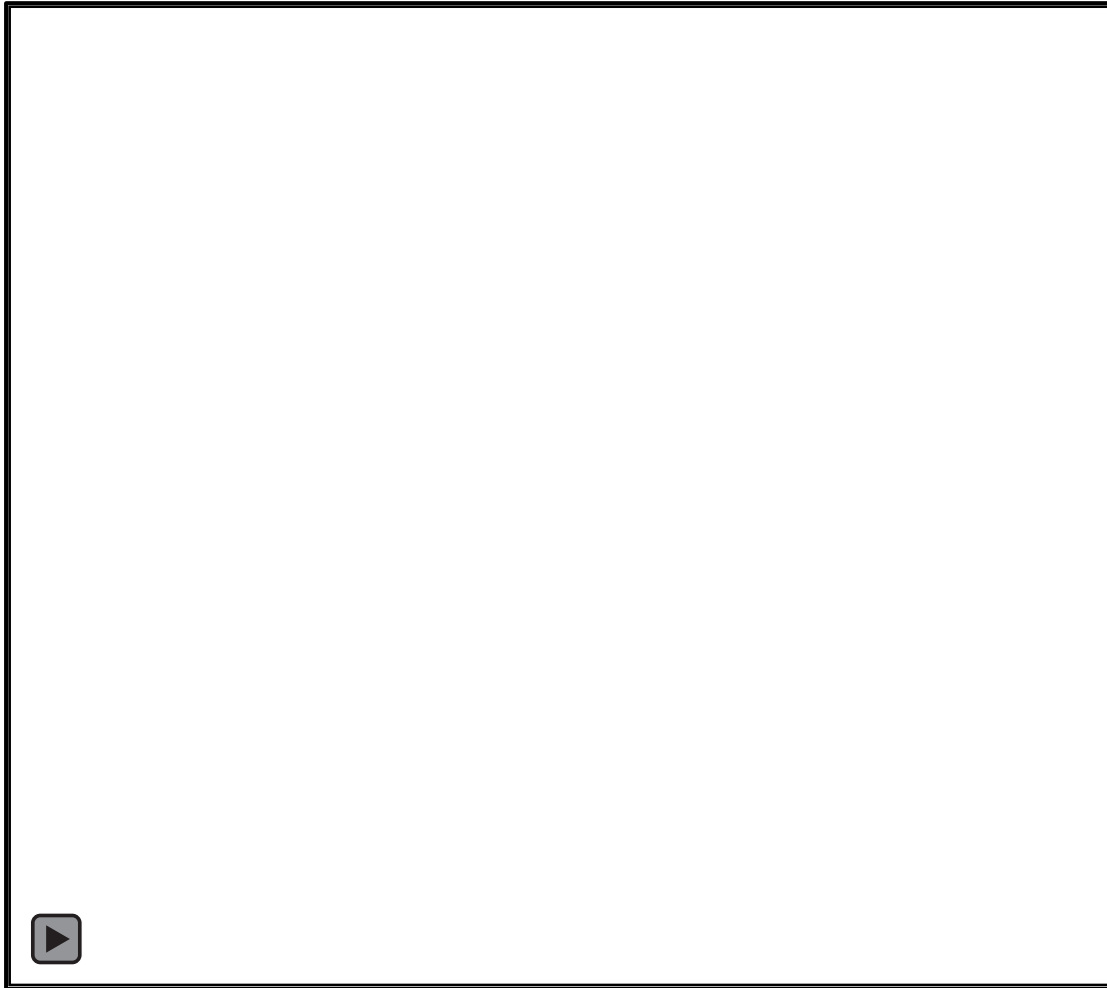
Optical Gas Imaging Cameras



OGI video of gasoline vapors emanating from storm drain grates at a bulk gasoline distribution terminal.

Courtesy: David Hindin and Chrisna Baptista, U.S. EPA

Optical Gas Imaging Cameras



(Above) Leaking vent at a floating roof tank facility.
Courtesy: Infrared Cameras Inc.

(Left) VOCs emanating from an aboveground storage tank.
Courtesy: David Hindin and Chrisna Baptista, U.S. EPA

Optical Gas Imaging Cameras

OGI in Regulations

- Approved as an alternative work practice* for EPA Method 21 leak detection for 40 CFR Part 60 (NSPS) Part 63 (NESHAP) rules.
- Specified as an option in NSPS Subpart OOOOa (Oil and Gas Rule)
- Including the OGI option in air permits

* Final rule: *Alternative Work Practice to Detect Leaks from Equipment*.
(73 FR 78199, December 22, 2008)
<https://www.gpo.gov/fdsys/pkg/FR-2008-12-22/pdf/E8-30196.pdf>

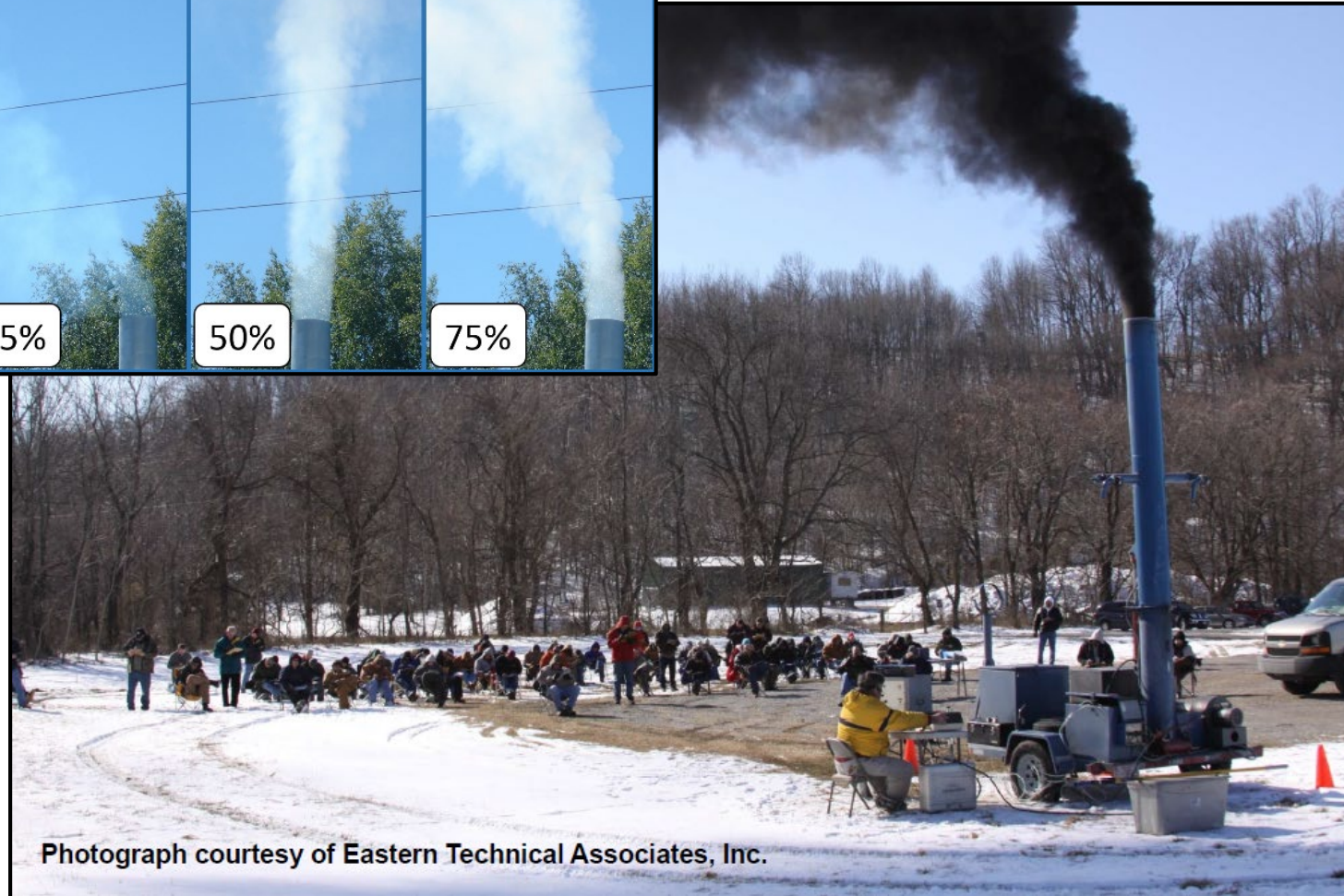
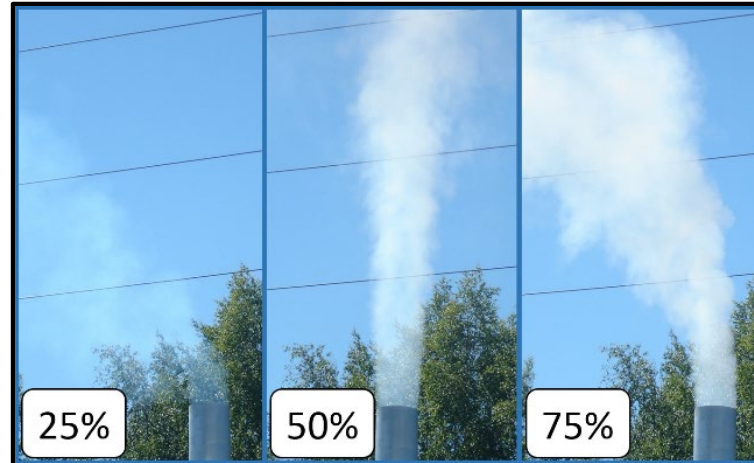


*Inspecting pipes for leaks using an OGI camera (top);
Manual leak detection (EPA Method 21) using a VOC detector
probe (bottom)*

Measuring Opacity

U.S. EPA Method 9 – Visual Determination of Opacity

- Standard method for determining compliance with permitted stack opacity limits.
- Opacity measurements by a trained and certified observer
- Field re-certification every 6 months



Photograph courtesy of Eastern Technical Associates, Inc.

Method 9 observation training "Smoke school"

Using Digital Cameras for Opacity Monitoring

Digital Opacity Camera System (DOCS)

- Approved as an alternative to EPA Method 9 opacity measurement to determine compliance with opacity standards in NSPS and NESHAP. (Method ALT-082)*
- Images captured by trained/certified camera operator.
- Uploaded and reviewed by a (third party) certified analyst.

* See ALT-082 Approval of Method 9 Alternative Revised (May 15, 2012) at:
<https://www.epa.gov/emc/broadly-applicable-approved-alternative-test-methods>



Using Digital Cameras for Opacity Monitoring

Digital Opacity Camera System (DOCS)

Benefits

- Good documentation of readings
- Greater consistency
- Remote monitoring
- Convenient method for more frequent observations if desired to assess performance

Drawbacks

- Cost of third party analysis



Other Uses for Digital Imagery (Non-Compliance)

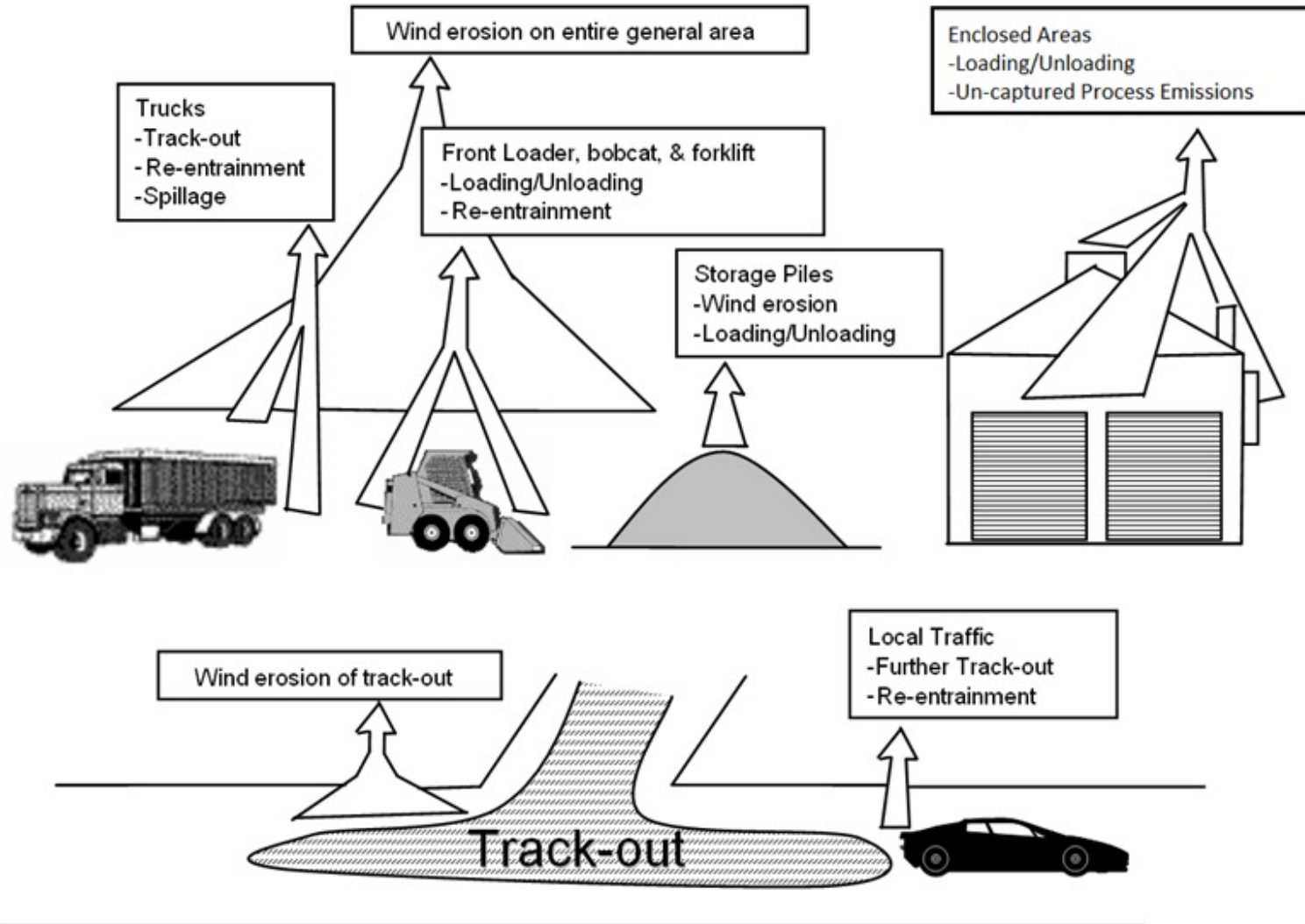
Cameras and video cameras can also be used as a qualitative indicator of performance to help reduce emissions, rather than for demonstration of compliance.

- No restrictions on type of source or camera / 3rd party analysis
- Remote monitoring
- E.g., fugitive dust monitoring
- Leverage existing camera surveillance systems



Comprehensive Work Practice

Fugitive Dust Plan



Thinking differently

- Controlling fugitive dust during freezing weather
 - Applying crust-forming chemicals such as mineral salts, petroleum resins, asphalt emulsions, acrylics and adhesives
 - Applying other non-petroleum based dust suppression fluids
 - Dry fog mist

Please check if these require other permits such as groundwater

- Wind erosion controls
 - Trees, bushes
 - Barriers
 - Air curtain

Enclosed chute



Dustless spout

Innovative Solutions

- Video camera surveillance
- Thermal imaging (relatively inexpensive)
 - Useful to track hot process emissions
 - Address maintenance concerns (overheating of ball bearings / internal components)
- Existing security equipment

Use of Drones to monitor environmental parameters





KNOW

YOUR PROCESS

CONTROL

YOUR PROCESS

How we can help

- Provide guidance on the technology right for your industry
- Provide resources
- Work with industry/industry associations - reach out to more facilities; create a level playing field
- Strive to be a norm rather than an exception

Thank you

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