AMCA International

Troubleshooting Problems in Fan Systems

Ronald Wroblewski

President, Productive Energy Solutions, LLC

Madison Wisconsin

ron@productiveenergy.com

PRODUCTIVE ENERGY SOLUTIONS LLC

Air System Engineering & Technology (ASET) Conference–US

San Antonio, TX • Hyatt Regency San Antonio Riverwalk • March 6 - 7, 2018

Professional Development Hours (PDH) Certificates

The Air Movement and Control Association International (AMCA), has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to the RCEP. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by NCEES or RCEP.

NCEES

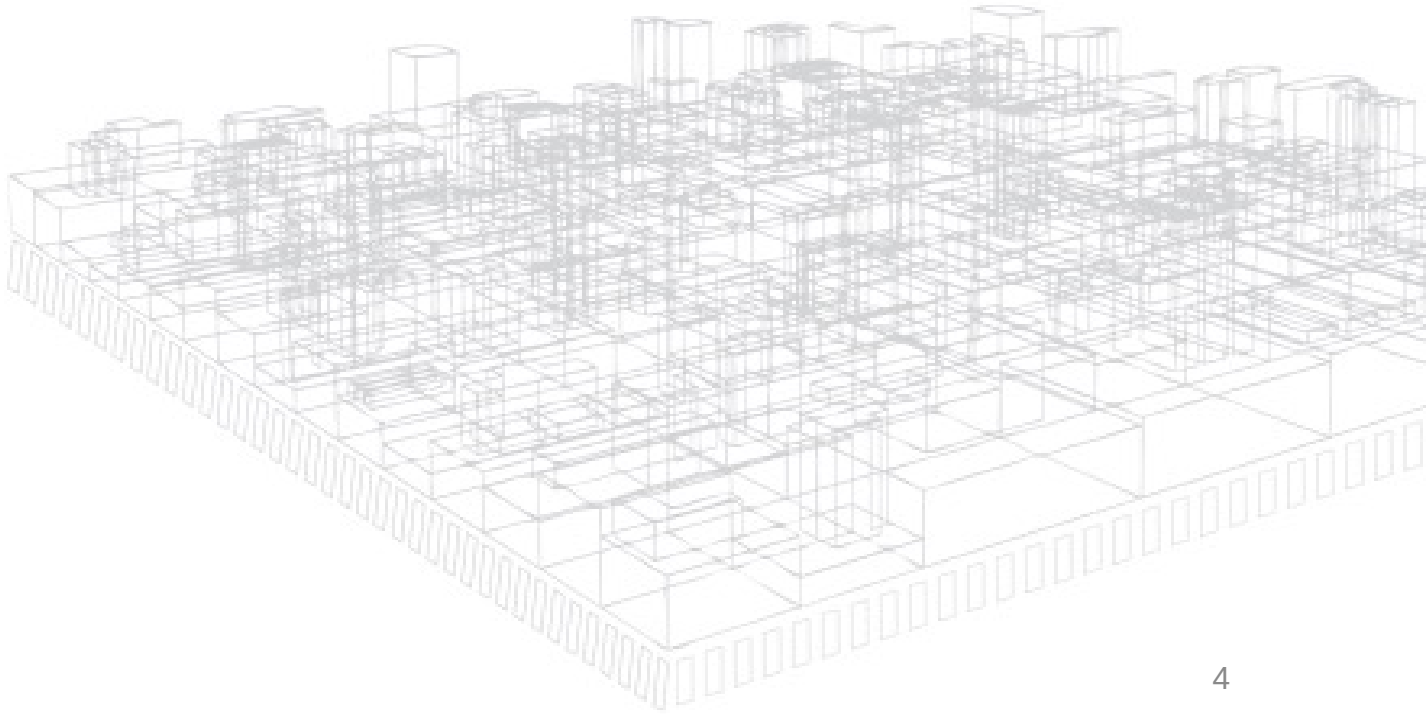
RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

Copyright Materials

This educational activity is protected by U.S. and International copyright laws. Reproduction, distribution, display, and use of the educational activity without written permission of the presenter is prohibited.

Learning Objectives

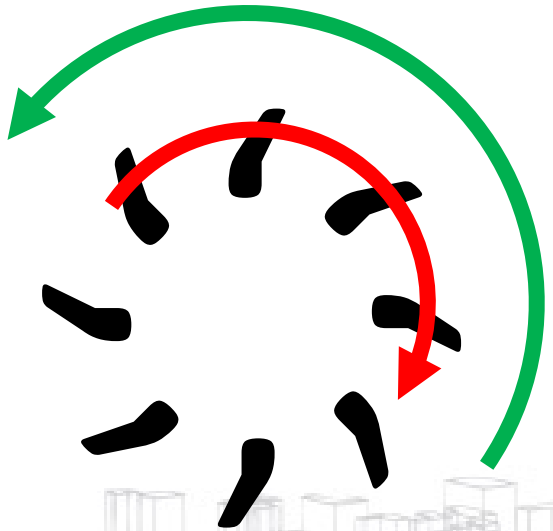
- List main indicators of fan problems
- Identify typical causes of problems
- Suggest possible remedies



Problems in Fan Systems

1. Reverse Rotation
2. Corrosion/ Erosion
3. System Effect
4. Stall / Surge
5. Imbalance
6. Motor Failure
7. V-Belt Failure
8. Bearing Failure

Reverse Rotation



Indicators:

- Inadequate flow
- Lack of pressure

Causes:	Remedies:
• Reversal of two electrical phases	• Rewire motor for correct rotation

Indicators, Causes and Remedies

- *Form* a small team of 3 or 4 people sitting near you
- Starting with the problem assigned to your group, *list* the indicators, causes and remedies
- *Send* someone to the corresponding flip chart to list your ideas
- *Address* other problems as chosen by team members in the 15 minutes of time allotted for small group discussion
- *Add* your ideas to the corresponding flip chart(s)
- We will *discuss* each problem as a group

Corrosion / Erosion

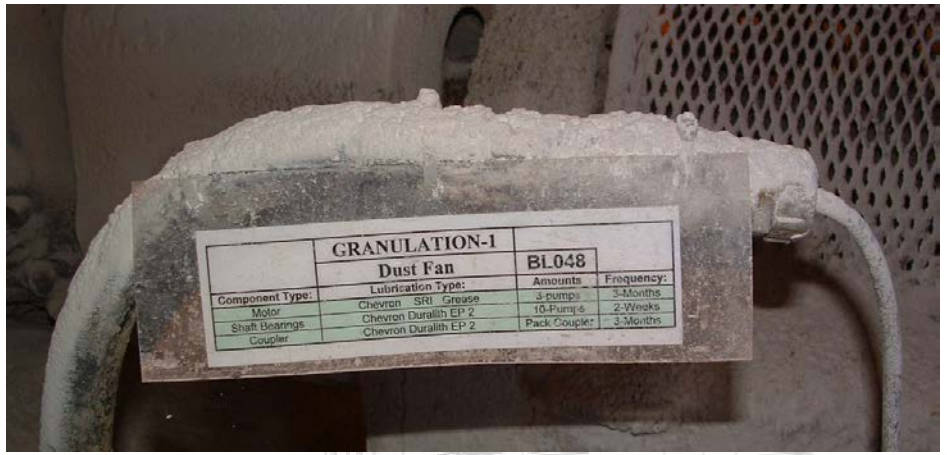
Indicators

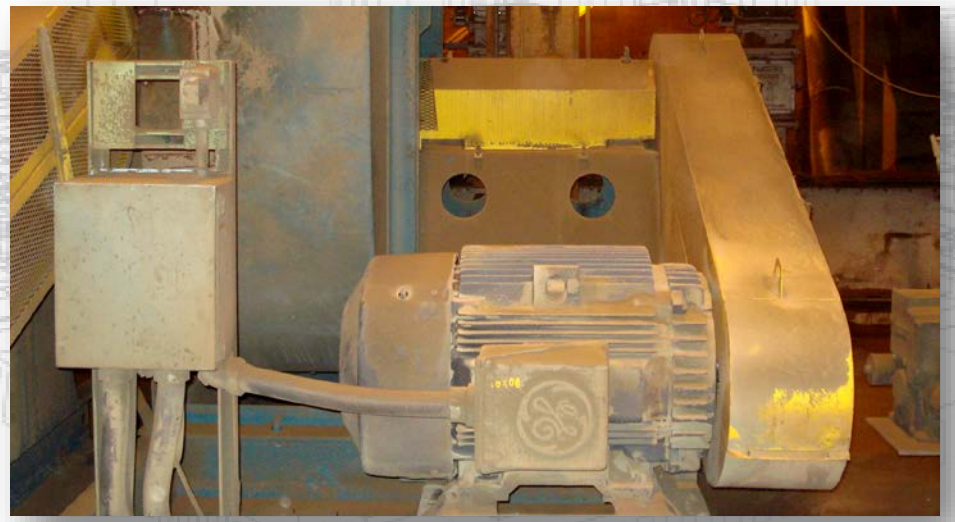
- Lack of airflow
- Imbalance
- Visual signs upon routine inspection

Corrosion / Erosion

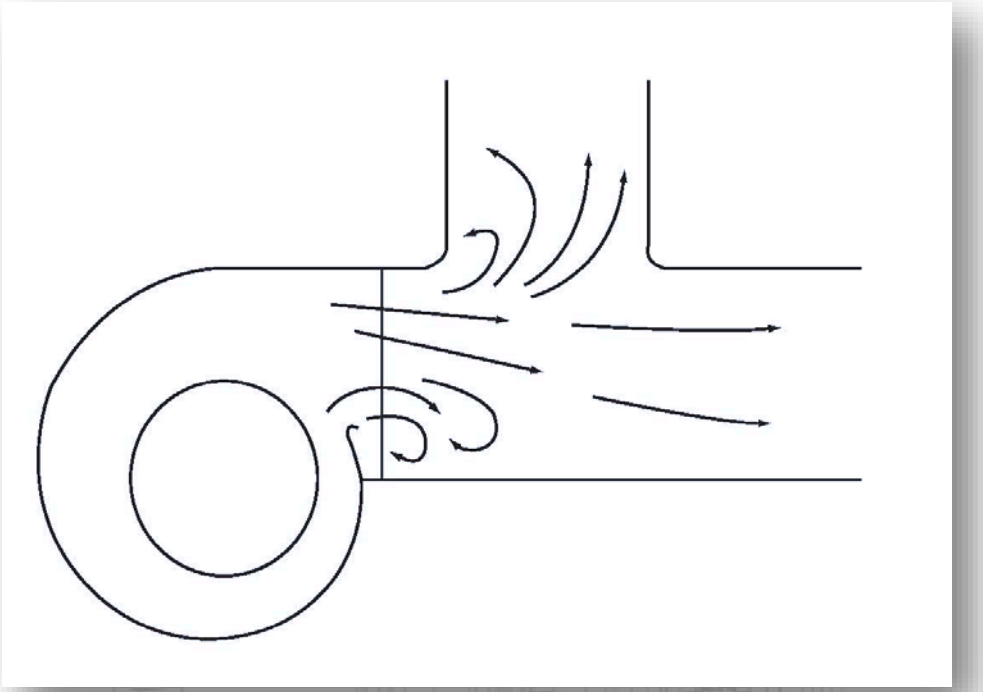
Causes:	Remedies:
• Particulate in airstream	• Replace wheel • Wear plates • Use upstream filter • Different style of fan wheel that can stand up to particulate • Wear plates
• Water or other corrosive agent present in airstream	• Employ anti-corrosive finish or use exotic metals in replacement wheel

Corrosion / Erosion





System Effect



Indicators

- Lack of performance

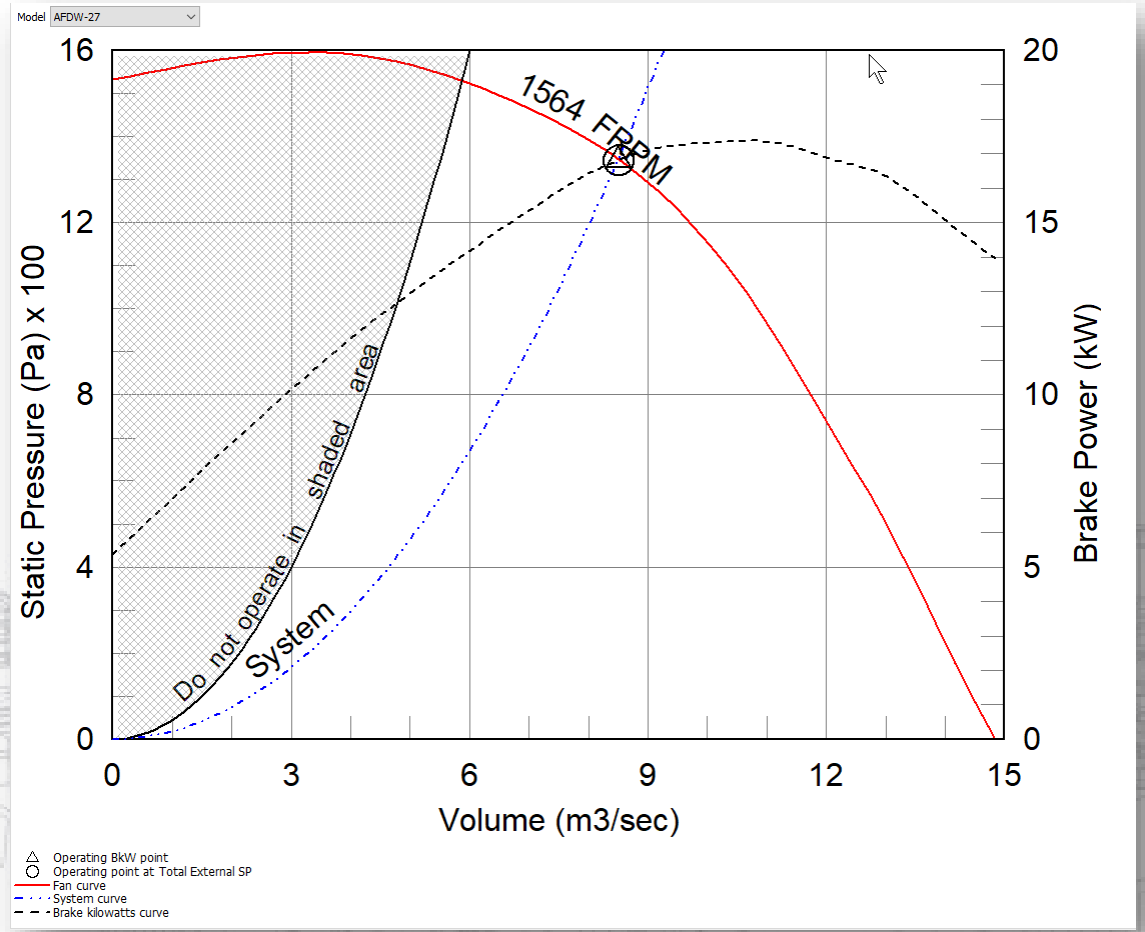
Causes:	Remedies:

• Poor installation practice:
  • Elbow or abrupt turn at Inlet
  • Lack of outlet duct
  • Abrupt turn at outlet
	• Rearrange ductwork
	• Speed up fan rotation
	  • uses much more power

Stall/Surge

Indicators

- Intense vibration
- Loud Rumbling
- Rising and falling pitch (whooping noise)
- Air coming out of the fan inlet
- Differential Fan Pressure Flips positive to negative



Stall/Surge

Causes:	Remedies:
• Operation near peak pressure of fan	• Change fan • Faster rotation • Change impeller
• Un-coordinated VFD control of parallel fans	• Better control coordination • All must rotate at same speed
• Discharge into large plenum especially with multiple fans	• Avoid designs with multiple fans discharging into common plenum
• Excessive pressure loss or clogging on filters, coils, etc.	• Remove blockage

Imbalance

Indicators

- Excessive vibration
- Vibration at same frequency as rotation

Causes:	Remedies:
• Uneven dirt loading	• Clean the impeller
• Known or unknown changes to impeller wheel	• Have a nice technician from fan company visit you to balance the wheel

Motor Failure

Indicators

- Smoke “gets out of the motor”
- Fan stops making noise and doesn’t deliver any airflow

Image courtesy Peterson Predictive Maintenance

Motor Failure

Causes:	Remedies:

• Electrical supply fault
  • Over / under voltage
  • Voltage imbalance
	• Correct electrical fault
	• Re-tap transformer
	• Balance single phase loads

• Power harmonics	• Better grounding • Proper cables • Harmonic filters

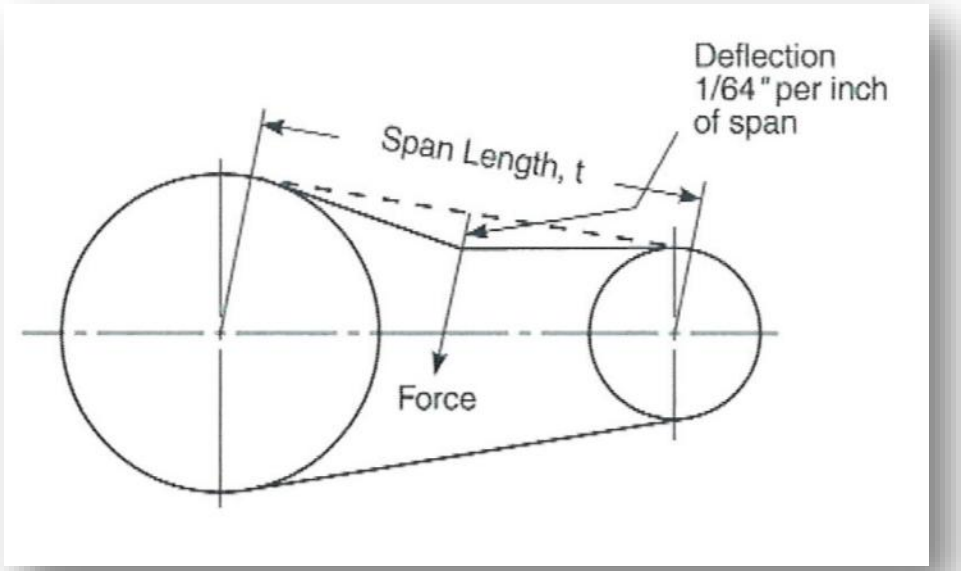
• Ambient environment fault
  • High temperature
  • Water / dirt
	• Correct ambient fault
	• Ventilate room
	• Use totally enclosed motor

• Power spike from higher than anticipated airflow (especially forward curved fans)	• Analyze system curve and choose a different fan

V-Belt Failure

Indicators

- No airflow
- Motor power and amps much lower than normal
- Belts that are loose or “slap”



Images courtesy Gates Rubber

V-Belt Failure

Causes:	Remedies:
• Limited life of belts • 8,000 – 10,000 hours considered normal	• Replace with new matched set

• Improper setup
  • To tight / loose
  • Not properly aligned
	• Properly tension and align belts
	• Re-tension after 24 hour break-in period

Bearing Failure

Indicators

- Excessive noise such as whining or growling
- Excessive vibration
- Smoke
- Shaft frozen in place and cannot turn

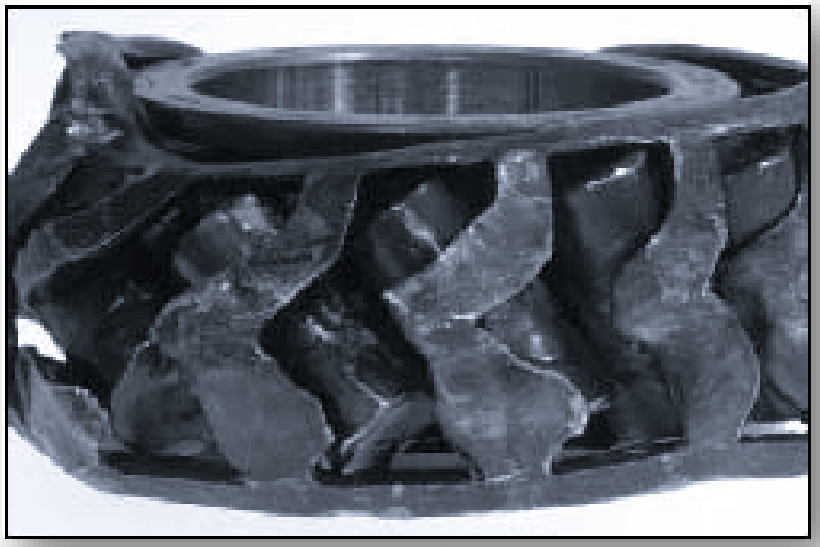


Image courtesy of Timkin

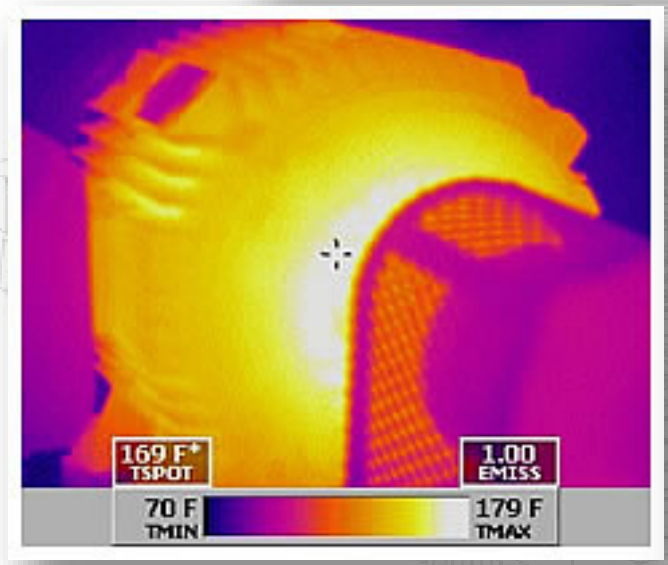


Image courtesy Peterson Predictive Maintenance

Bearing Failure

Causes:	Remedies:
• Improper maintenance	• Grease according to manufacturers schedule • Use proper grease • Use proper amount of grease • Purge old grease
• Electrical current through bearing from VFD	• Provide electrical ground path • Use insulated bearing
• Excessive load	• Avoid over-tightening belts • Mount pulley close to bearing

Image courtesy of Timkin

Image courtesy of Timkin

Questions?

Ronald Wroblewski
President
Productive Energy Solutions, LLC
ron@productiveenergy.com