1. **I am adding an SCR to my plant. Should I upgrade my existing fans, add a booster fan or install a new fan? How can I decide?**
   Considerations:

- Pressure required: High pressure requires high tipspeed → High wheel stress, Low specific speed (possibly lower efficiency) noisier
- Space available
- Time available for change-over
- Control – One fan easier than 2 in series
- Is current foundation OK for upgraded fan?
- Ductwork connections

3. What are the suggested maintenance operations and frequency to maintain fan efficiency and lengthen the life?

- Efficiency: Dampers/VIV's clean and operational, Rotors clean and not worn, wheel to inlet cone clearance
- Life: Lubrication, alignment, monitor bearing temperature and vibration
- Consult the fan supplier's O&M Manual!

4. Which is the best type of fan for each application in a power plant (centrifugal, variable pitch or axial) and why?

- Specific speed – axials typically higher (high flow/low pressure)
- efficiency
- turn-down range
- particulate load – erosion/build-up
- Ref. AMCA Publication 801, Specification Guidelines

5. My flue gas has a high particulate load. What is the best way to improve the life in a highly abrasive environment?

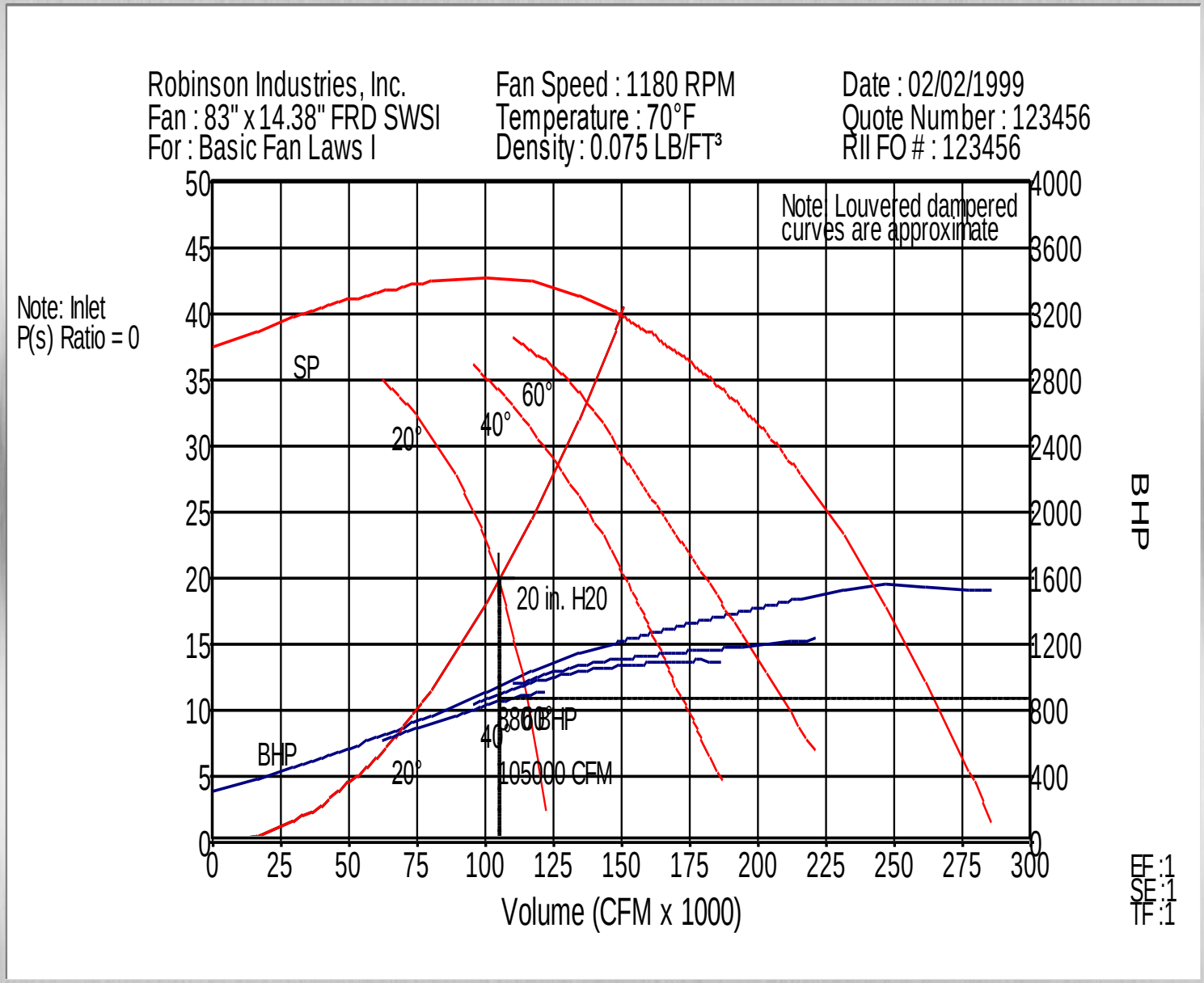
- Velocity related – exponentially
- DWDI vs. SWSI
- Low speed vs. High speed
- Blade profile
- Liners: AR plate/ Chromium carbide/tungsten carbide/ceramic
  Wheel, Casing, Inlet boxes, Inlet cones

6. How can I decide whether a fixed speed fan with dampers or a fan with a variable speed motor for fan control is best for my application?

- Initial cost vs operational cost
- Amount of turn-down

Example: Inlet Louvered Damper Control:

Turndown condition requires 880 BHP



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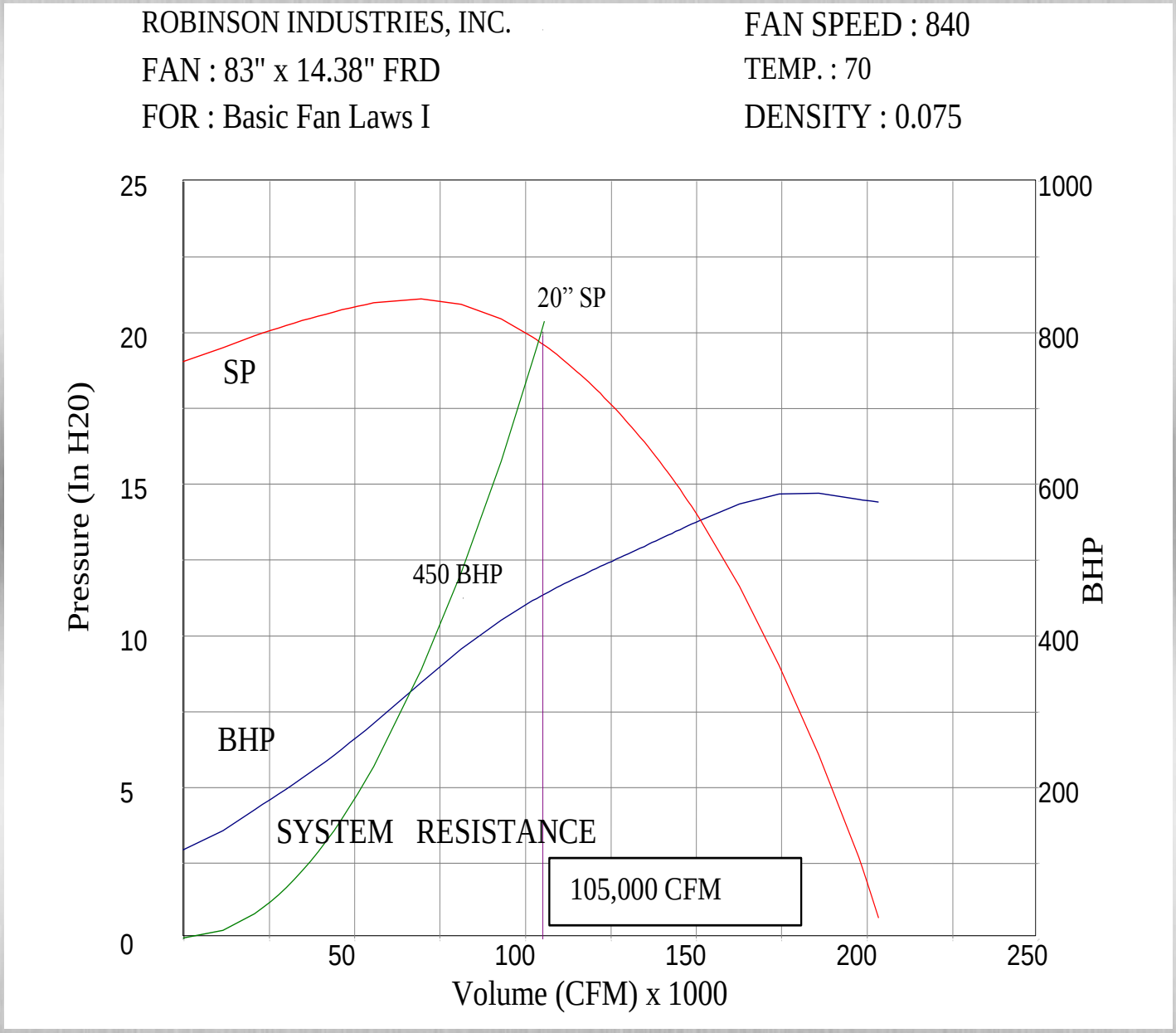
Example: Speed Control: Same turndown condition requires 450 BHP



7. How can I optimize the performance of my fans to improve efficiency?

- Field test – Establish baseline current performance
- Control range required
- Consider rotor retrofit – Performance must be confirmed via lab model prototype test
- Don’t neglect mechanical and other operational concerns

8. What speed should I specify? Why?

High speed:

- smaller
- lower cost
- higher Ns, higher efficiency(?)
- higher velocities
- higher wear
- higher bearing peripheral speed

9. **Do I need to specify an overspeed test for the fan rotor?**

- The end user can feel more comfortable knowing that the rotors have been tested at speeds in excess of the actual maximum operating speed.
- Inspection of the rotor welded joints before and after testing (using non-destructive inspection techniques) provides further proof that the rotor can tolerate such high stress levels without any cracks developing.

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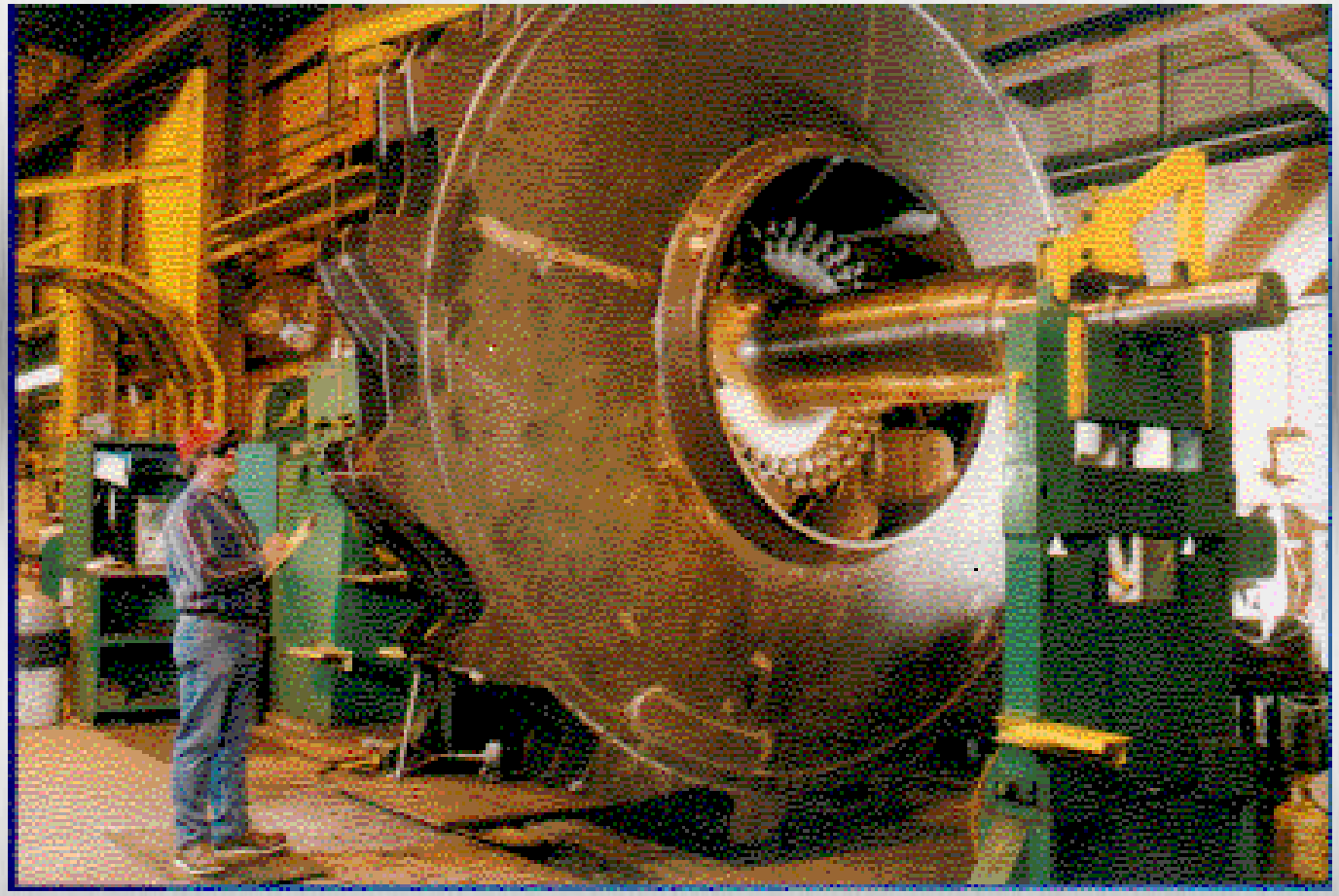
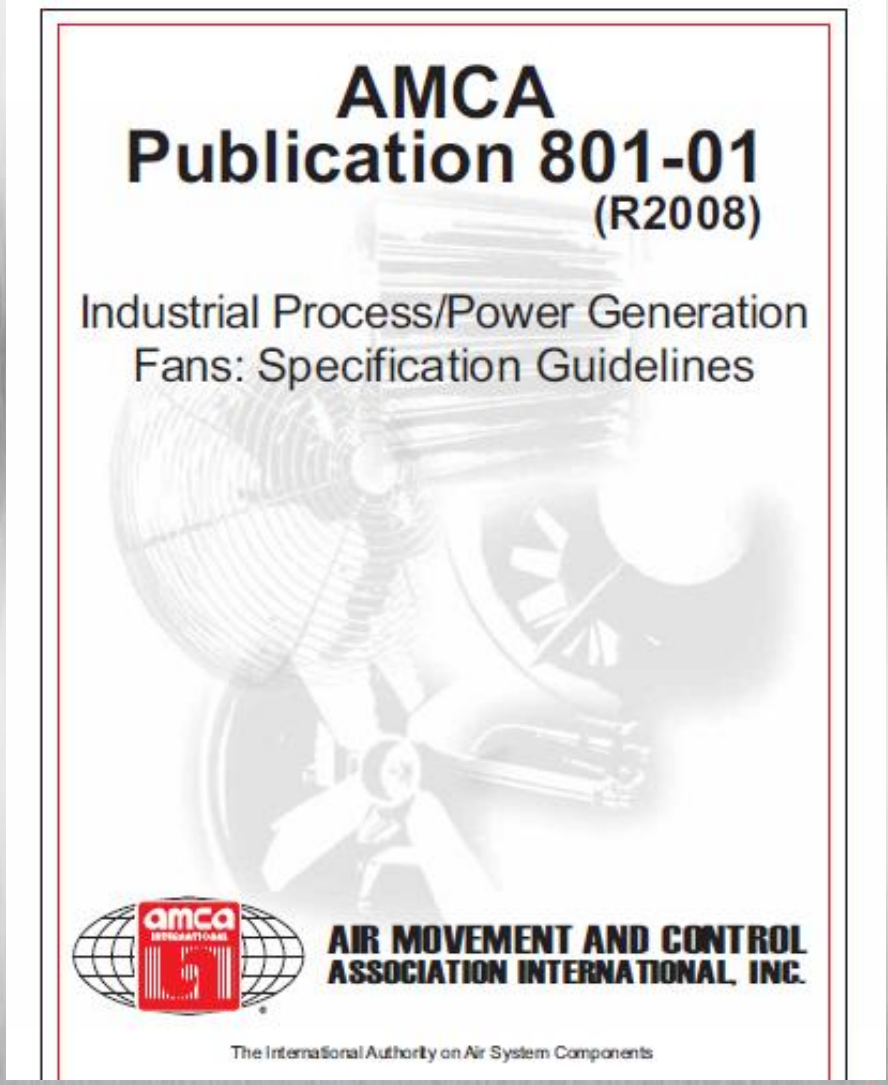
What balance quality grade should I specify?

- ANSI S2.19 Grade G2.5 is appropriate for most fan applications in the power industry. Ref. AMCA/ANSI 204



11. What source would you recommend for learning about basic fan performance parameters and definitions?

- AMCA International (Air Movement and Control Association) 801, 99, etc.



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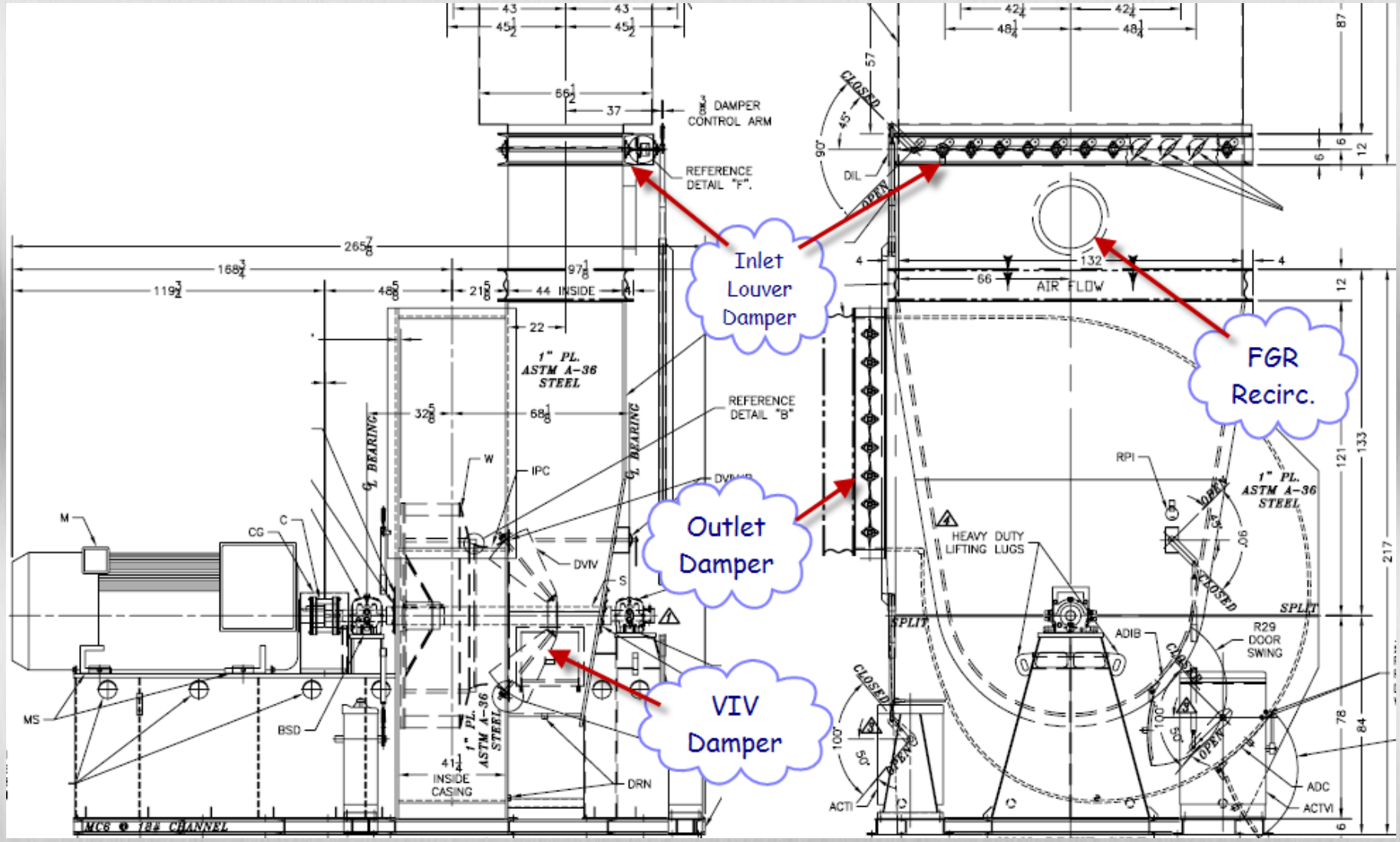
12. What happens if I throttle my fan too much with the inlet control dampers?

Boiler FD Fan: *Squeeze Points – OUCH!*



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13. What factory testing and analyses should be specified?

Options include:

- Wheel stress FEA
- Fatigue analysis
- Wheel modal analysis
- Torsional
- Lateral
- shop balance
- Impeller overspeed test
- CFD