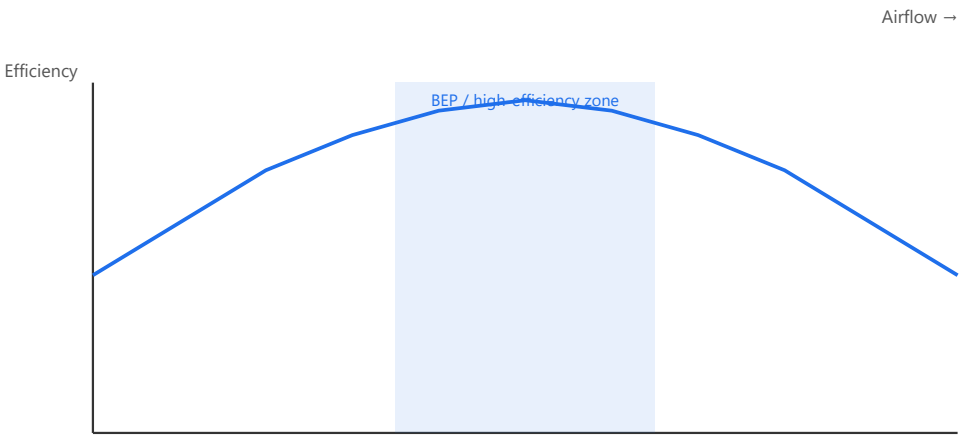
FM203 Improper Blade Number → Flow Pulsation, Noise and Efficiency Loss

Chapter 2: Structural Features — Fault model & typical case

DOCUMENT	CHAPTER	RELATED Q&A	PUBLISHER
FM203	**Structural Features**	**2-30, 2-31**	**Kunshan Best Machinery Equipment Co., Ltd.**

Fault model + typical case. Mechanism, causes, symptoms, diagnosis, corrective actions and prevention are all anchored to the relevant entries of the Fan Engineering Q&A (see front matter for question references).



FM203: efficiency peaks at the best-efficiency point (BEP). A wrong blade number lowers efficiency and raises the discrete noise peak, so the duty should be kept in the high-efficiency zone after a blade change.

Failure Mechanism

Too many blades increase friction and blockage, while too few make the blade passages too wide, increasing flow separation and pulsation (2-30, 2-31 empirical formulae). Both lead to an efficiency reduction and discrete noise.

Common Causes

- Blade number not verified when replacing the impeller during maintenance
- Design not matched to the flow velocity

Failure Symptoms

- Noise peaks at a specific frequency
- Low efficiency

Diagnosis & Evaluation

- Spectral analysis of the discrete peaks
- Compare against the design blade number

Corrective Actions

- Determine a reasonable blade number from the empirical formulae and the flow velocity

Preventive Measures

- When replacing an impeller, keep the original design blade number or carry out a new hydraulic design

Typical Failure Case (Summary)

(A representative real case of the same fault mode) A centrifugal fan originally used 6 blades and reached 85 dB(A); after increasing to 8 blades the load per blade was shared and the wake interference was weakened, so the noise fell to 82 dB(A); but at 10 blades the wake interference between blades intensified and the discrete noise peak rose again to 83 dB(A), so 8 blades is optimal. This project confirms that too few blades (separation, vortex shedding noise) or too many (wake interference, higher discrete noise peak) both worsen noise and efficiency, so when replacing an impeller during maintenance a reasonable blade number must be determined from the empirical formulae and the flow velocity.

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