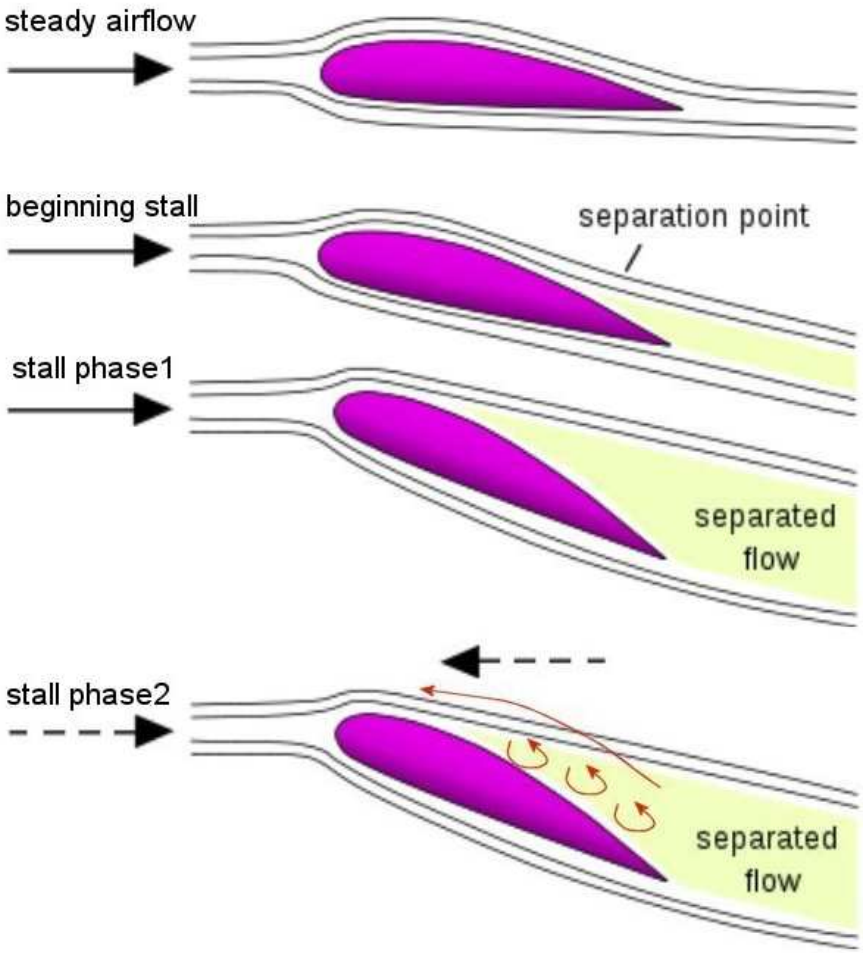
STALL, problem and solutions

- High frequency vibrations (blades & hub)
- Stimulation of natural frequency
- Cracking by fatigue

Content

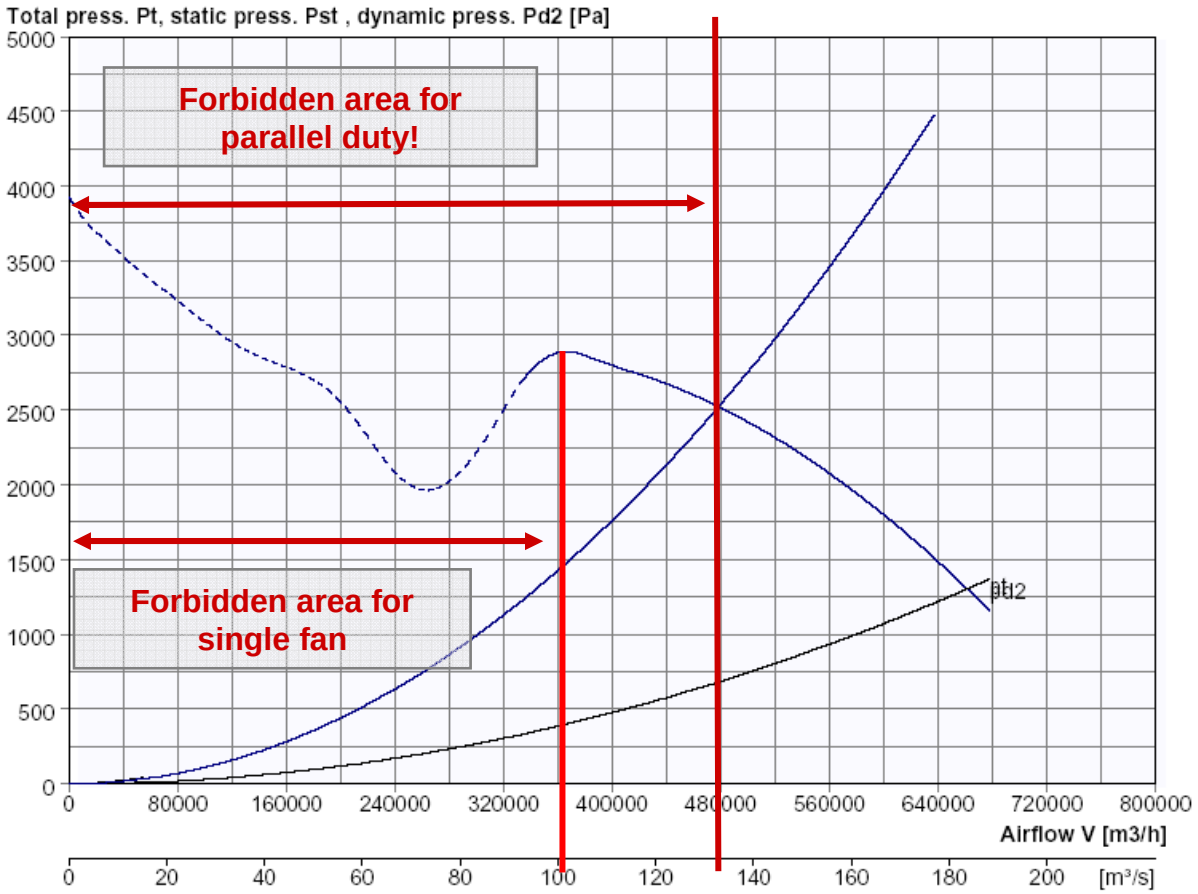
- What is stall?
- Typical axial fan curve
- Reasons for rotating Stall
- System requirements
- Solutions – Pros and Cons

What is STALL



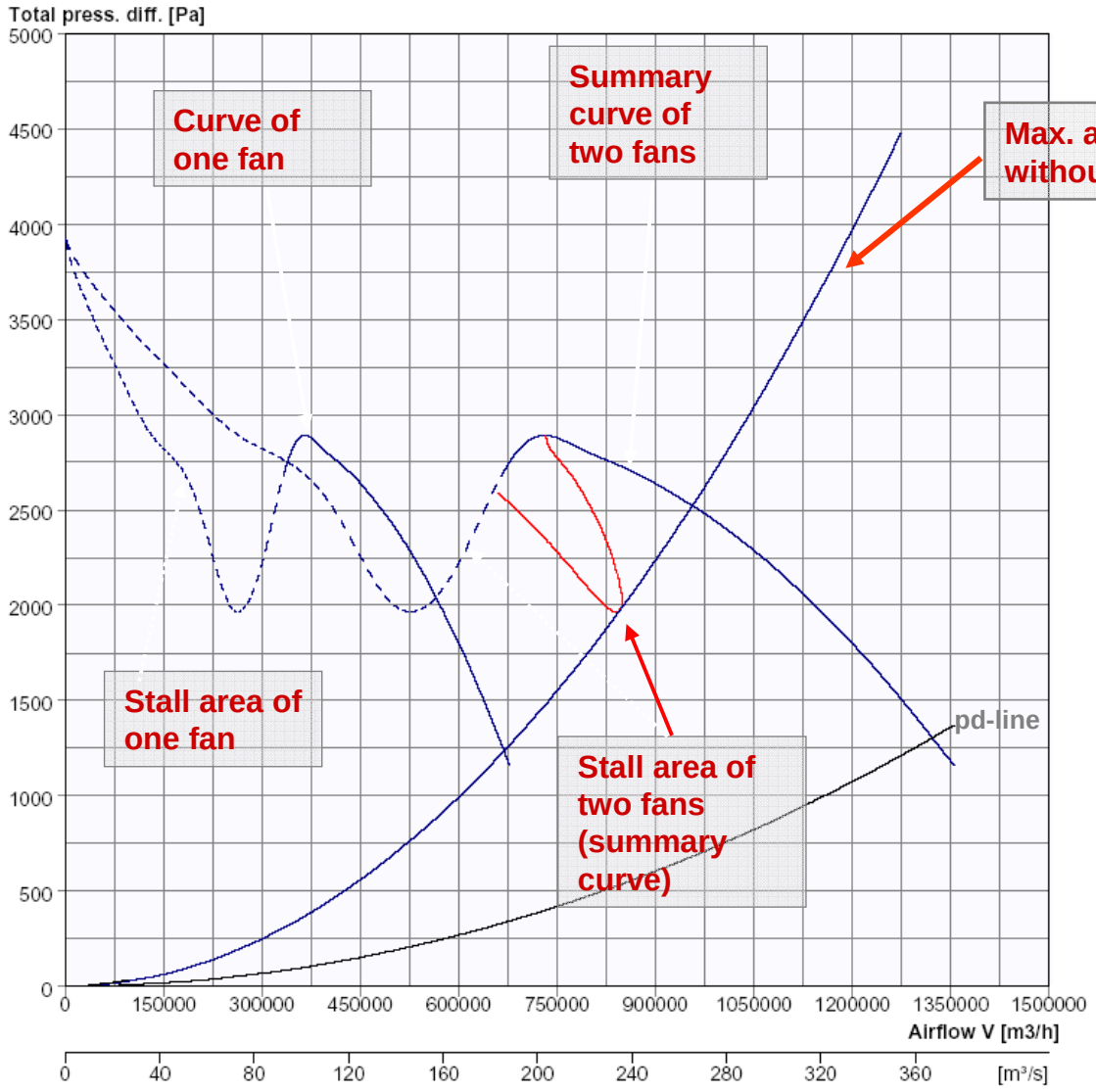
- Disturbance causes the air flow to separte from one or more of the blades.
- This blocks the air flow through the corresponding blade cell.

Typical axial fan curve



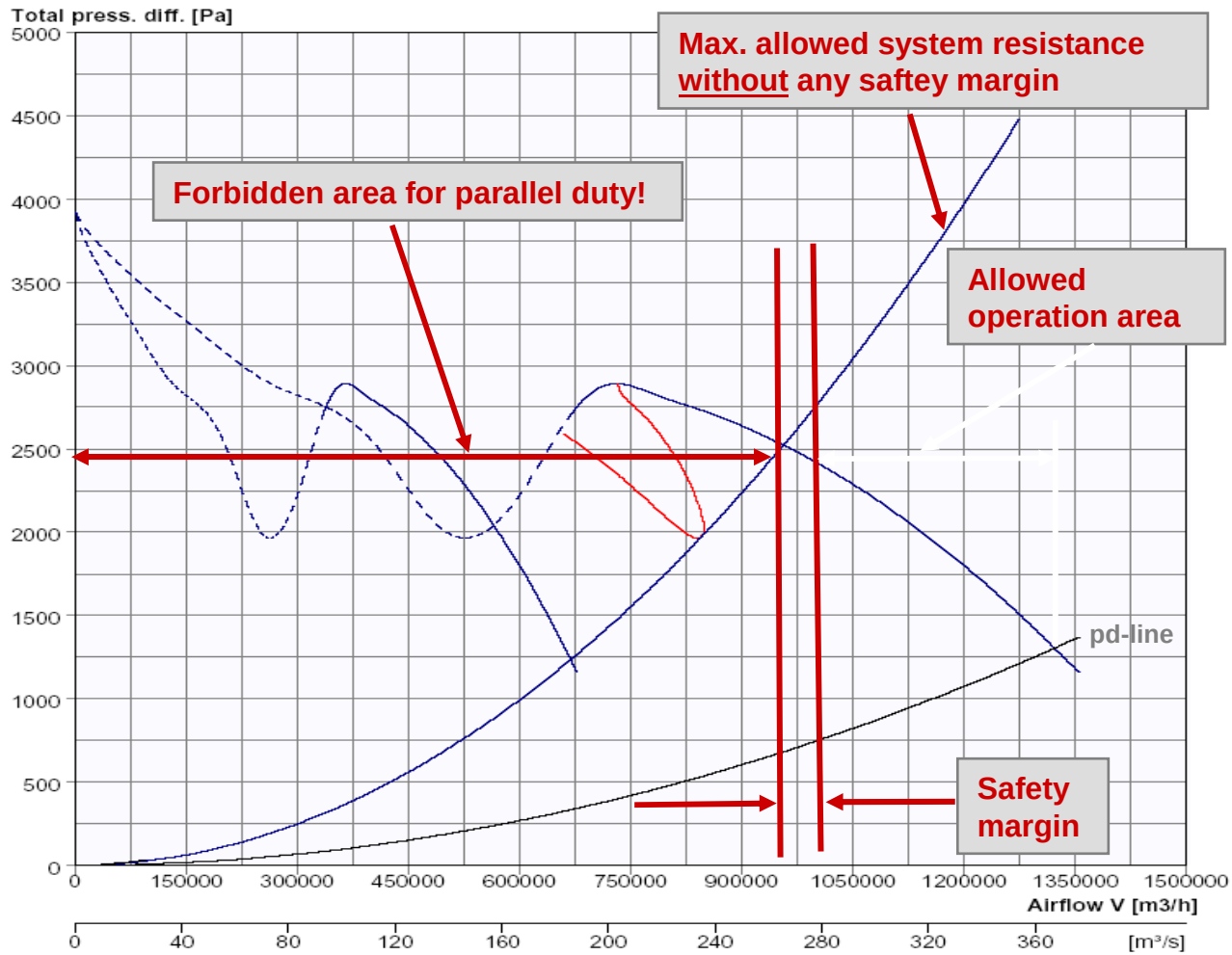
The STALL zone for axial fans in parallel often is much larger than expected !

Typical axial fan curve



Several fan suppliers do not show or do not know in detail the STALL area at their fan curves

Typical axial fan curve



Summary:

Allways ask for fan curves starting at 0m³/s

Reasons for Rotating Stall at fans

- Turbulent inlet or outlet flow at the fan
- Increased system resistance because of unexpected aerodyn. behaviour
- Wrong system design / calculation
- Short-term pressure pulses

General requirements for Stall-free fans

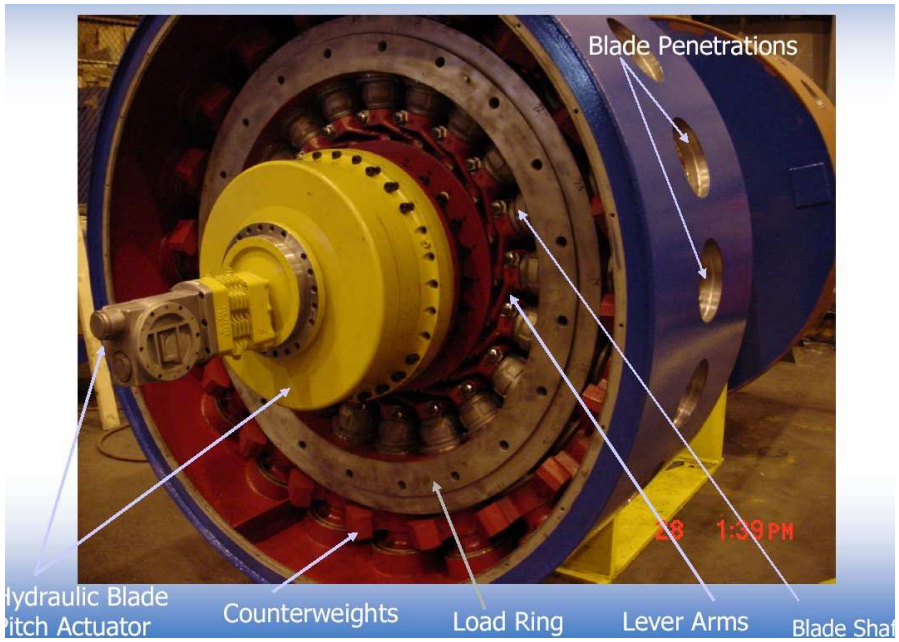
- Restricted space in the ventilation building
- Heat resistant
- Up to 100% reversibility
- Highest possible volume flow at parallel operation
- Highest possible efficiency
- Cost-efficient (not too expensive)
- High operational safety (robust against system fluctuations)

Solution no. 1: centrifugal fan

Pros
▪ STALL-free
▪ High pressure
▪ Extremely heat resistant

Cons
▪ No Reversibility
▪ Low air flow
▪ Large space requirement
▪ Optimised for one duty-point only
▪ Price

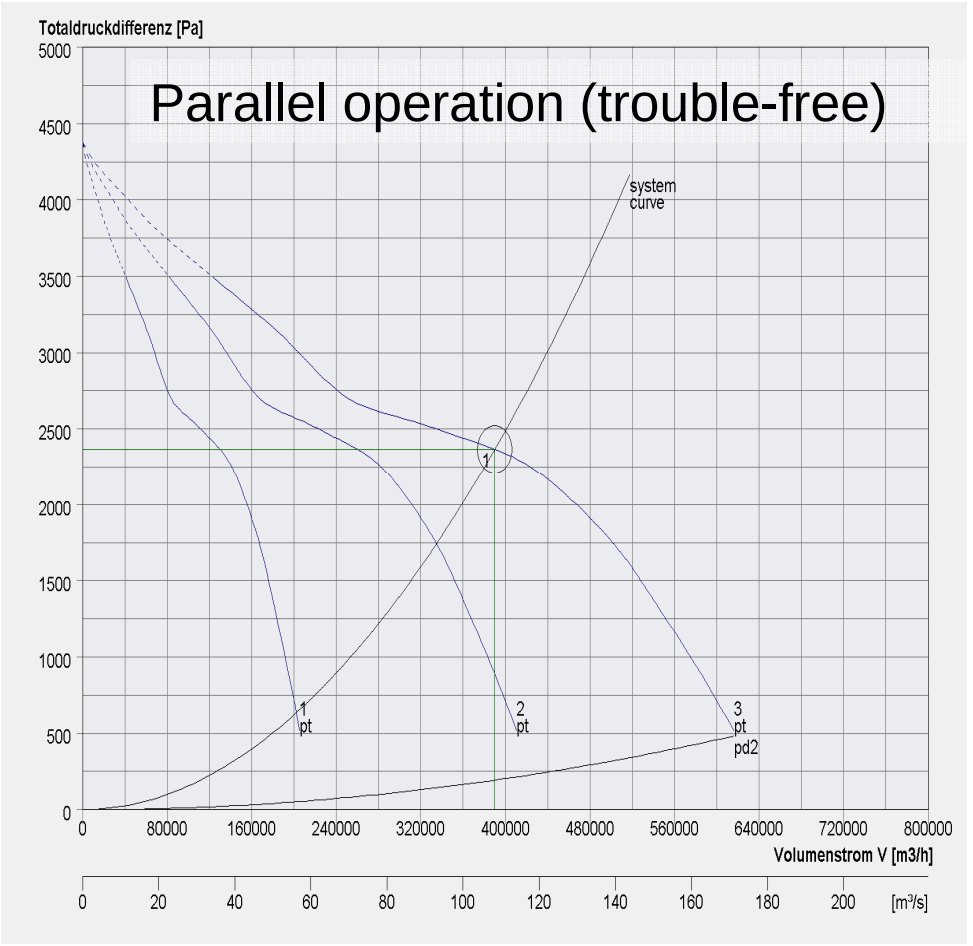
Solution no. 2: Variable pitch in motion



Pros
▪ Adjustable in motion

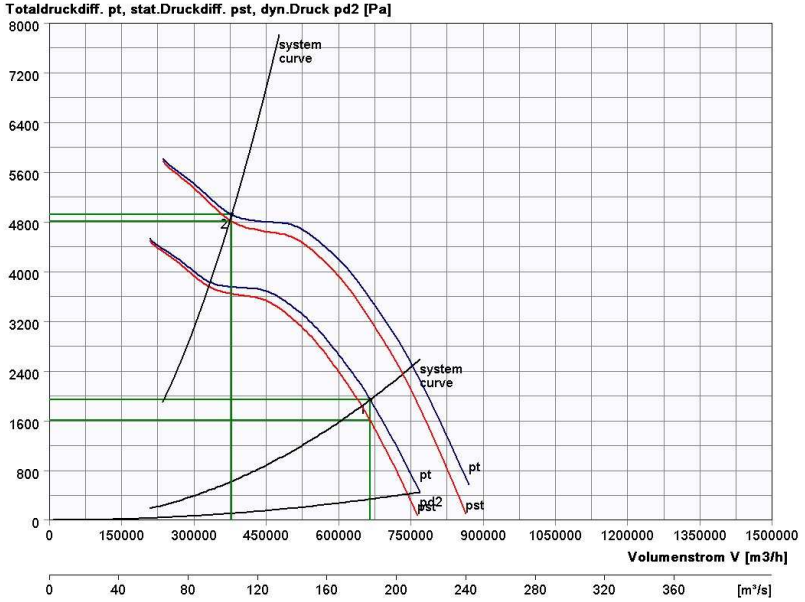
Cons
▪ Not Stall-free
▪ Operational safety (hydraulic system, bearings at each blade)
▪ Expensive maintenance
▪ Price

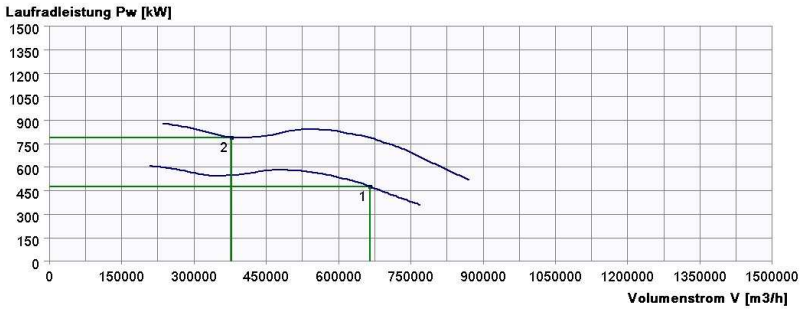
Solution no. 3: STALL-free fan curve



Solution no. 3: STALL-free fan curve

Ventilatortyp :





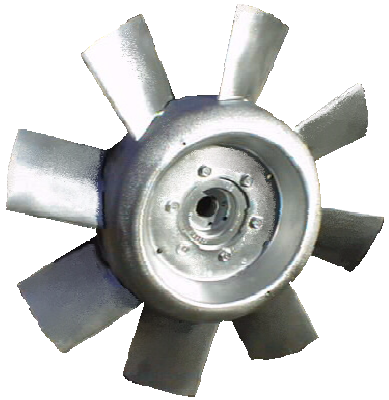
		1	2			
Schaufelstellung		V0.36	V0.36			
Volumenstrom	V [m3/h]	666.000	378.000			
Ansaugdichte	Rho [kg/m3]	1,200	1,200			
Ventilatordrehzahl	n [1/min]	550	622			

Pros
▪ Stall-free also in parallel operation!
▪ Operation saftefy – simple & robust
▪ Low space requirement
▪ Heat resistant
▪ Fully Reversible
▪ Price

Cons
▪ Medium (compared with centrifugal)
▪ Several duty-points only with VSD possible

WITT&SOHN

IGW Ventilatoren



Witt & Sohn AG©

Wuppermanstr. 6 - 10

25421 Pinneberg

Tel.: +49 4101-7007-0

Fax: +49 4101-7007-30

E-Mail: witt@wittfan.de

www.wittfan.de