

VARIABLE GEOMETRY AXIAL COMPRESSORS

1. Introduction

2. Philosophy of Varax

- 2.1 Variable speed versus adjustable guide vanes
- 2.2 Selection of basic stage type for variable stator vane control
- 2.3 Influence of stage type on secondary effects:
 - Radial blade clearance vs. performance
 - Hub to tip ratio vs. stage efficiency
 - Axial spacing between stator and rotor vs. efficiency and noise

3. Operating of Compressor

- 3.1 Differential setting of guide vanes
- 3.2 Shift of characteristics for different gases and conditions
- 3.3 Anti-surge control system

4. Operating Experience

- 4.1 Aerodynamic effects on the rotor
- 4.2 Blade fatigue due to surge
- 4.3 Particle accumulation in axial compressor bladings

FIELD MEASUREMENTS OF BLADE STRESSES

5. Mechanical design concept
6. Causes of blade vibrations
7. Blade vibrations - measuring methods
 - 7.1 Strain gauges
 - 7.2 Frequency modulated grid
 - 7.3 Laser
 - 7.4 Induction pick-up
8. Alternating stresses
9. Blade vibrations in rotating machines
 - 9.1 Supporting vanes at compressor inlet
 - 9.2 Asymmetrical inlet flow distribution
 - 9.3 Wake of inlet and diffuser blading
 - 9.4 Influence of rotating stall, surging and guide vane setting on blade stresses in industrial axial compressors
 - 9.5 Rotating stall
 - 9.6 Surging
 - 9.7 Blade vibrations due to variable guide vane angle
10. Possible measures against blade excitation
11. Protection of axial compressors
12. Conclusions