INTRODUCTION

The concept of thermal efficiency or fuel utilization becomes so dominant in the decision regarding power generating and power absorbing equipment that more complex schemes are being considered and are economically feasible.

The improvement of the cycle and component efficiency is one approach for the single Brayton cycle; the analysis of combined cycles and the utilization of fluids other than air provide another solution.

The relatively high temperature at which the waste heat is rejected offers a great opportunity for better fuel utilization with the Brayton cycle for providing one is willing to accept a more complex scheme. The closed cycle gasturbine with electricity and heat production or a combined gasturbine - steamturbine cycle demonstrate fuel utilizations of 65% to 85%.

The larger production units in the chemical and steel industry require larger process compressors with an increased reliability and a large operating range.

The recent increased rate of installation of nuclear power station has produced a pressing demand for enriched uranium fuel. The availability of this fuel is a critical element in the energy policy of many countries. Insufficient or non-existing enrichment capacity for civilian use has forced the European countries to pool their effort in the design and construction of large capacity uranium isotope separation plants. These enrichment processes require a very large number of special axial flow compressors.

The axial flow compressor, as an independent driven unit in these special applications or as a large component of the gasturbine, has been chosen as the study object of this lecture series. The aero-mechanical aspect of the axial flow

compressor will be stressed and examples given for a wide variety of fluids and applications.

The mechanical integrity of the whole unit will be analysed in the contribution on bearings, while the lectures on vibration and flutter will treat the aeroelastic effects on the single elements, the blades.

Transonic design problems are treated using the heavy gas compressor as an example while the incompressible flow problems are discussed in the context of a Helium compressor.

The air and process compressor is represented by the contributions on a large gasturbine and on the variable geometry for large flow margin in industrial blowers.