

Lecture on the subject  
KKE/TSM - Boosting combustion engine theory

Roman Gášpár



Podpořeno v rámci projektu CZ.1.07/2.2.00/15.0383  
Inovace studijního oboru Dopravní a manipulační technika  
s ohledem na potřeby trhu práce

# ***Boosting combustion engine theory***

## ***Basic schemes***

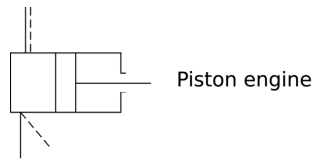
## **INTRODUCTION**

- Turbocharging – during this process is transported air with higher mass flow rate and pressure to the combustion chamber. Turbocharging is provided by compressor.
- Turbocharger – device for compression of the transported media to the combustion chamber.

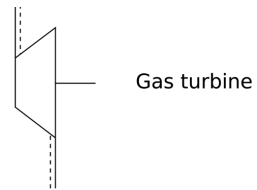
## **INTRODUCTION**

- Reasons for power increasing for internal combustion engines (Diesel – VM, Petrol ZM, Gasoline– BM i Gas – PM):
  - Power is increasing (economical aspect)
  - Transporting speed is increasing
  - Fuel consumption decreasing

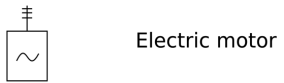
## BASIC SCHEMATIC SYMBOLS



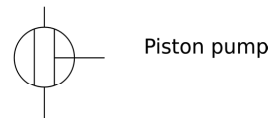
Piston engine



Gas turbine



Electric motor

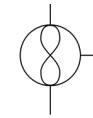


Piston pump

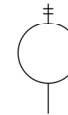
## BASIC SCHEMATIC SYMBOLS



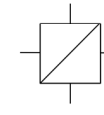
Centrifugal compressor



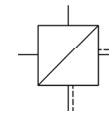
Axial compressor



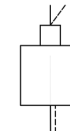
Generator (DC)



Heat exchanger ( air - water )



Heat exchanger ( gasses - air )



Combustion chamber

## BASIC SCHEMATIC SYMBOLS



Gearing



Clutch



Appliance (mechanical)



Pump

— Water

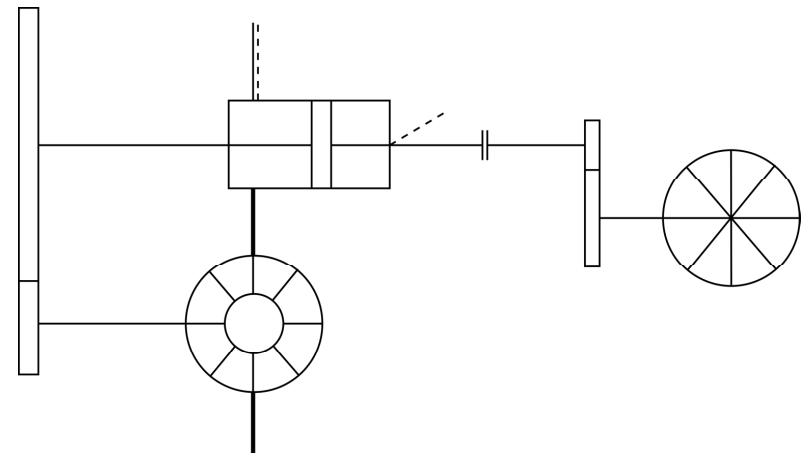
— Air

- - - Liquid fuel

= = = Gas

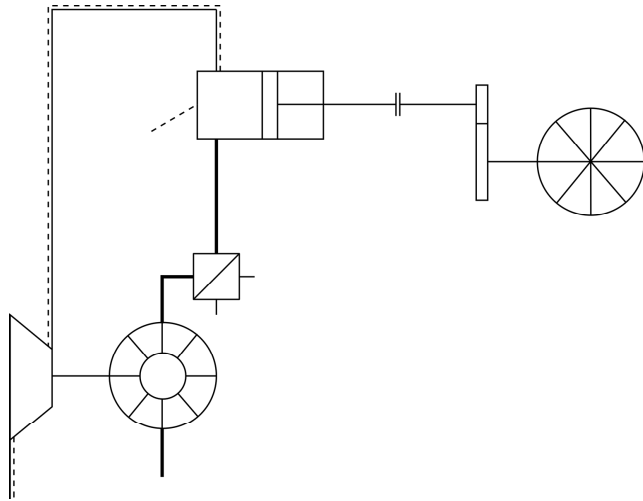
= = = Steam

## BASIC SCHEMES



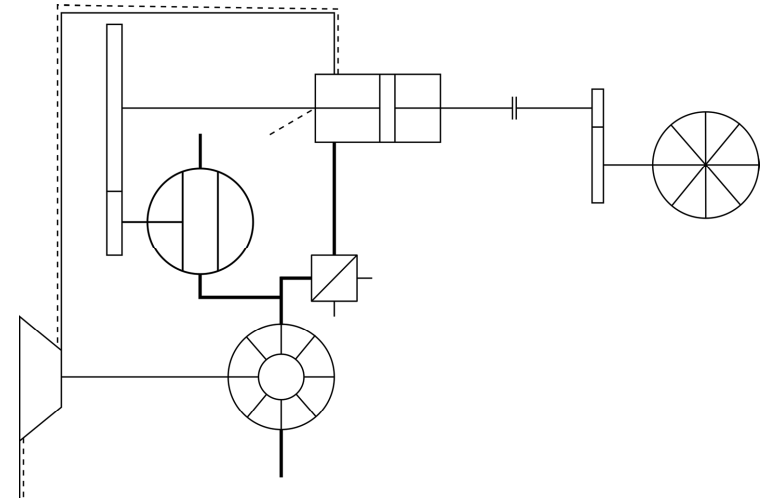
*Fig. Compressor driven by engine*

## BASIC SCHEMES



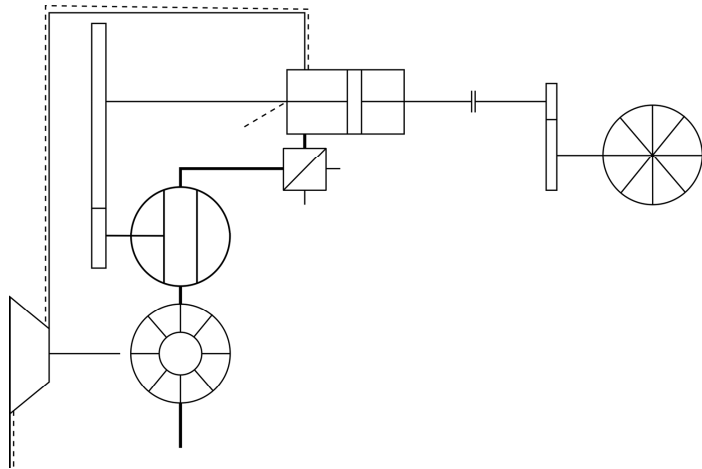
*Fig. Basic conception – Turbocharged, four-stroke cycle engine with cooled filling air*

## BASIC SCHEMES



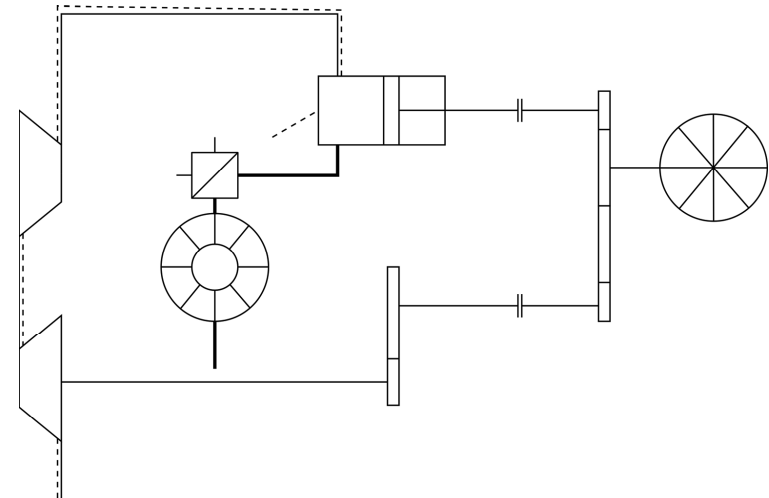
*Fig. Parallel conception – Turbocharger and auxiliary flush compressor driven directly by engine*

## BASIC SCHEMES



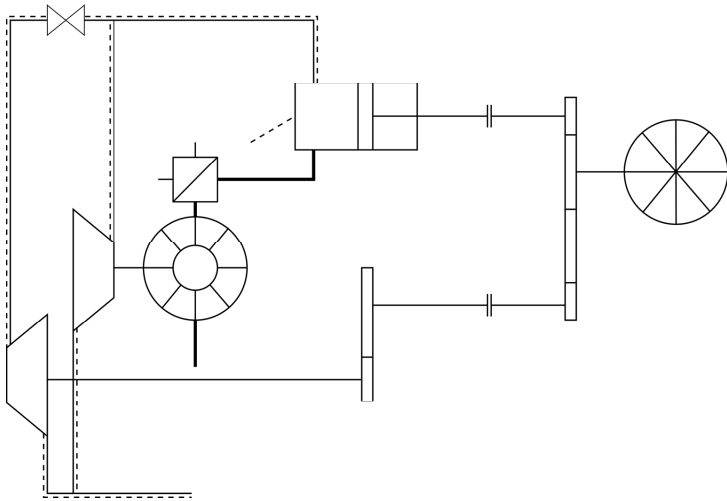
*Fig. Serial conception – Turbocharger and auxiliary flush compressor driven directly by engine (Turbocharger works as 1. stage)*

## BASIC SCHEMES



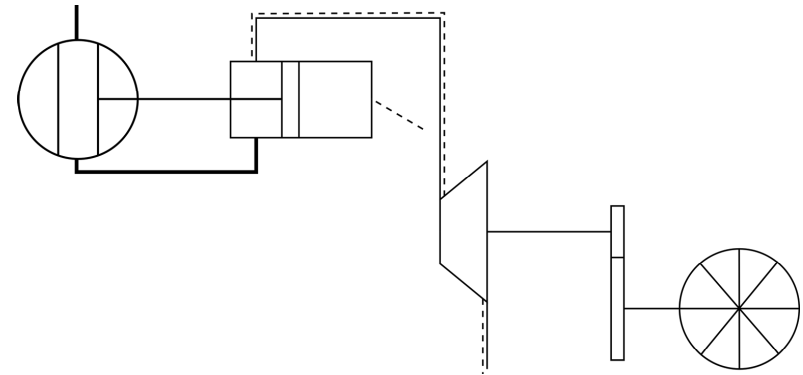
*Fig. Parallel conception – Performance turbine*

## BASIC SCHEMES



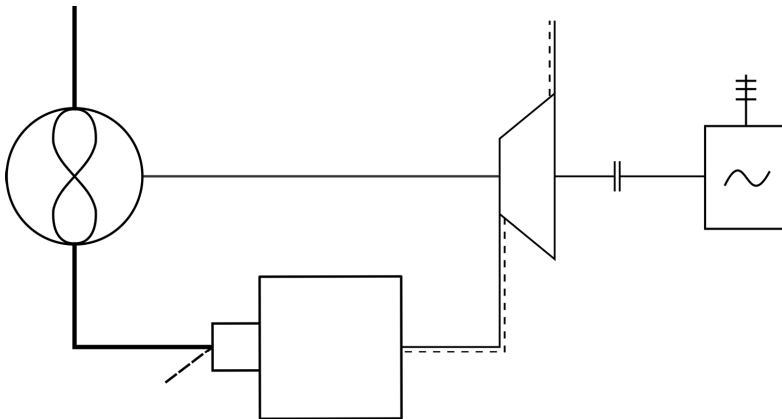
*Fig. Serial conception – Performance turbine*

## BASIC SCHEMES



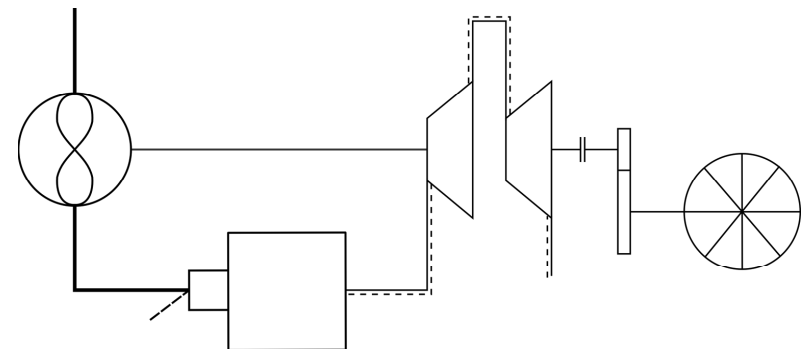
*Fig. Performance is consumed just from turbine*

## BASIC SCHEMES



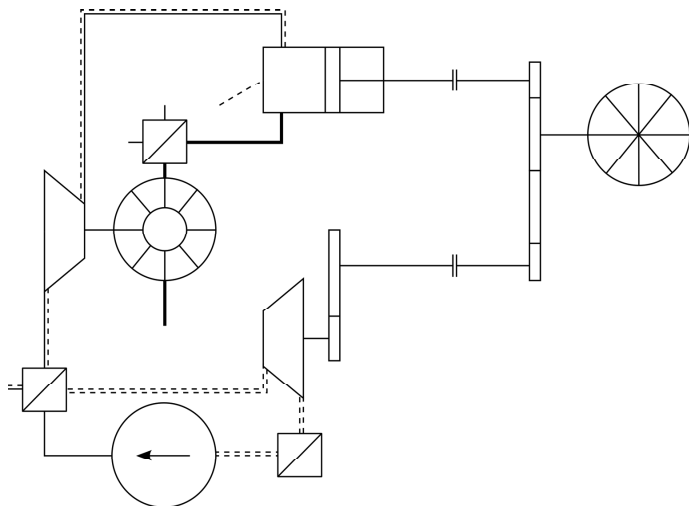
*Fig. Combustion turbine*

## BASIC SCHEMES



*Fig. Combustion turbine – dual-spool construction*

## BASIC SCHEMES



*Fig. Steam turbine*

## References

- [1] J. Macek; B. Suk : Spalovací motory I. - Praha 1996
- [2] L. Bartoníček: Přepřínování pístových spalovacích motorů – Liberec 2004
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- [5] Hiereth H., Prenninger P.: Charging the Internal Combustion Engine, Springer, Wien 2007
- [6] Bell C : Maximum Boost, Bentley Publishers, Cambridge – 1997
- [7] Baines C.N.: Fundamentals of Turbocharging, NREC, Vermont 2005

**DISCUSSION...**

**...QUESTIONS**



### Poděkování

Tento projekt je spolufinancován  
Evropským sociálním fondem a státním rozpočtem České republiky

Projekt CZ.1.07/2.2.00/15.0383  
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