Waste Heat Recovery Systems

COMMUNICATION SKILLS I
ASSIGNMENT # 2

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CONTENTS

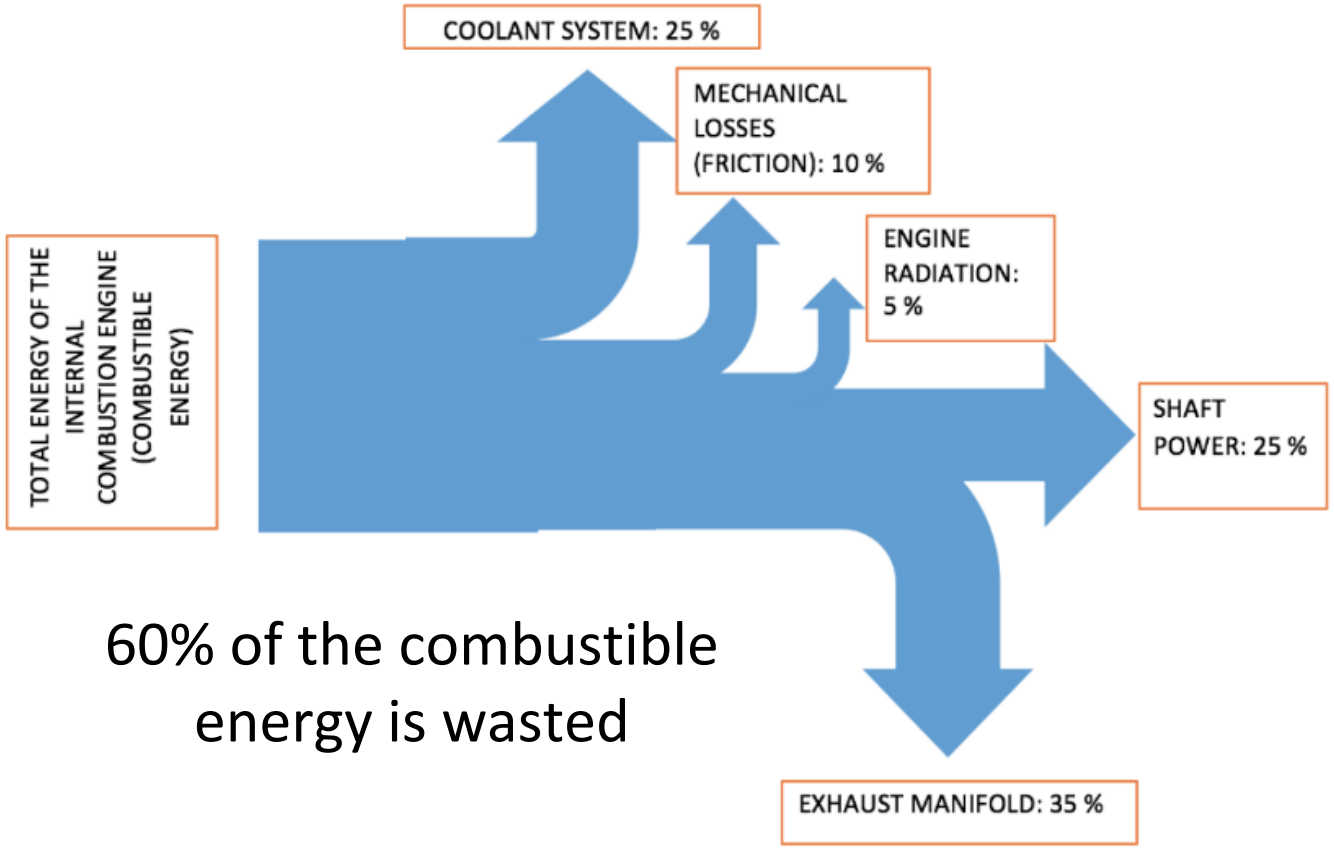
INTRODUCTION AND MOTIVATION

Current situation: very restrictive environmental regulations, especially in industry emissions

It is becoming really difficult to fulfill the emissions requirements by optimizing the traditional engine functioning

There is a need of new technologies

INTRODUCTION AND MOTIVATION



60% of the combustible energy is wasted

Waste Heat Recovery Systems appear

WASTE HEAT RECOVERY SYSTEMS

Thermo-electric Generators

Turbochargers

Organic Rankine cycle

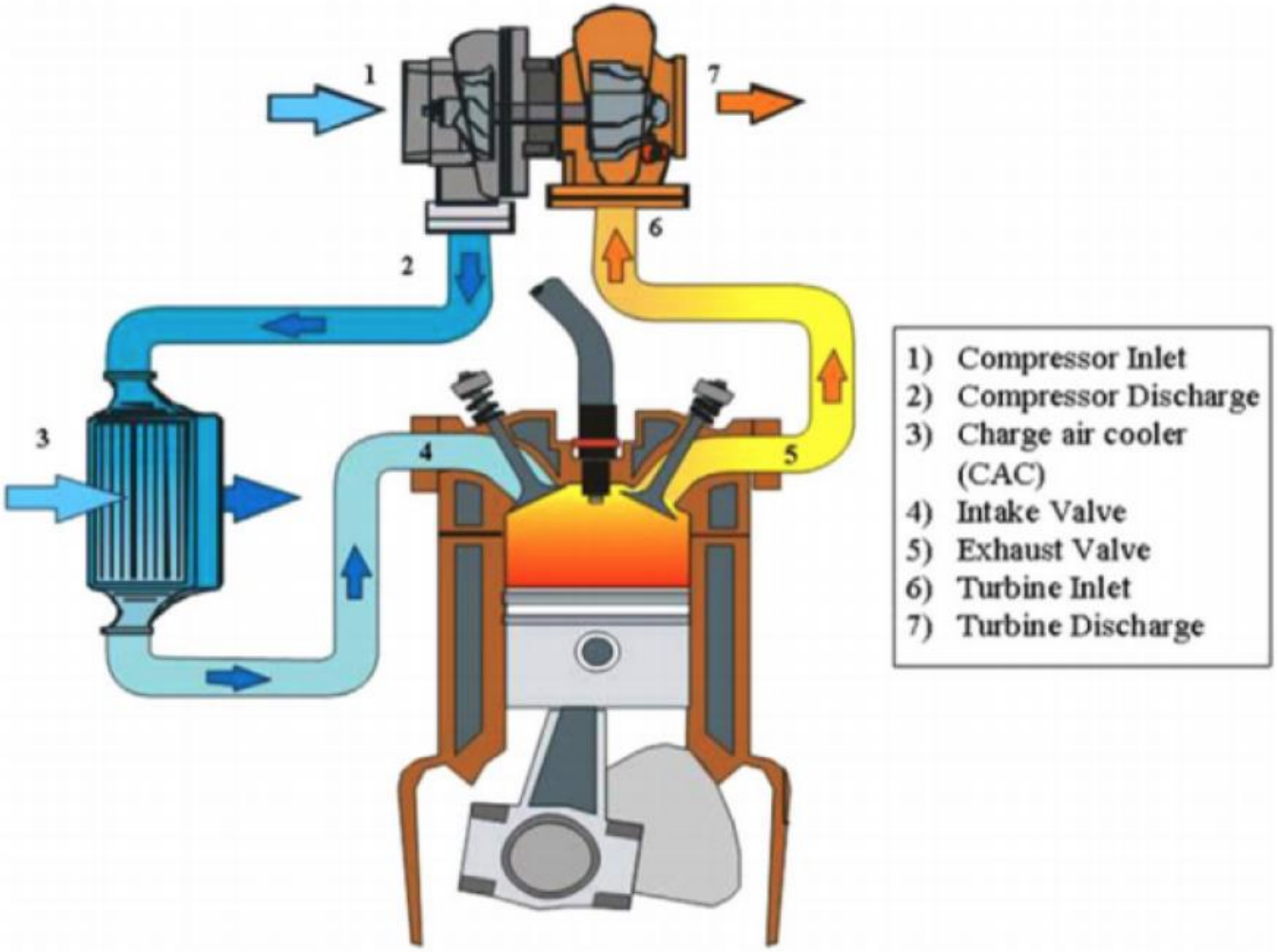
TURBOCHARGERS

Method to increase air density by increasing its pressure

Two main components: compressor + turbine

Functioning: Energy of exhaust gases drive the turbine which drives compressor

TURBOCHARGERS



TURBOCHARGERS

Main turbocharger drawback → TURBOLAG

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Solution → ELECTRICAL TURBOCHARGERS

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Components:

- Compressor & Turbine
- +
- Generator & Storage device

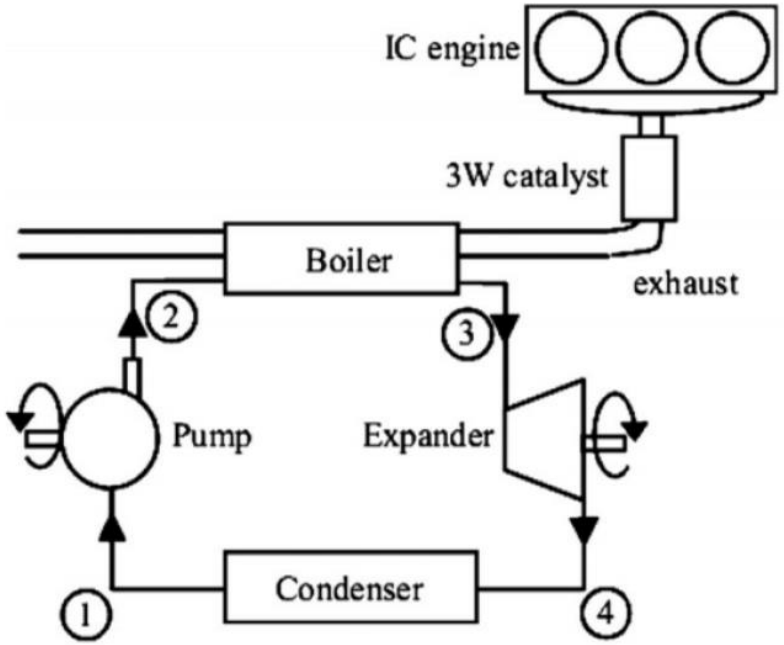
ORGANIC RANKINE CYCLE

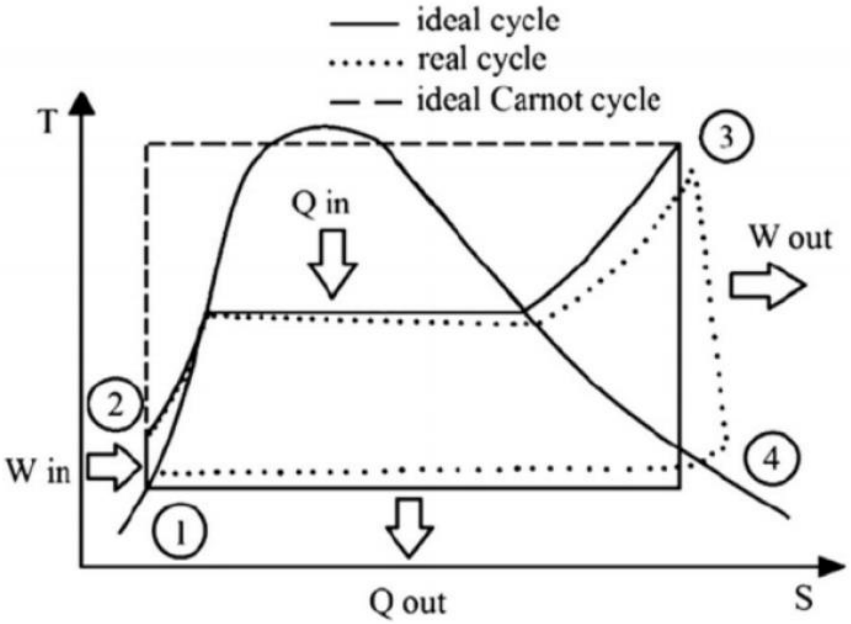
Based on the same working principle as water/steam Rankine cycle used in power plants

Four elemental components:

- Pump
- Evaporator
- Turbine
- Condenser

ORGANIC RANKINE CYCLE





ORGANIC RANKINE CYCLE vs STEAM CYCLE

Difference: ORGANIC working fluid

Main features (compared to water):

- Low boiling point at same pressure
- Low specific volume

ORGANIC WORKING FLUIDS

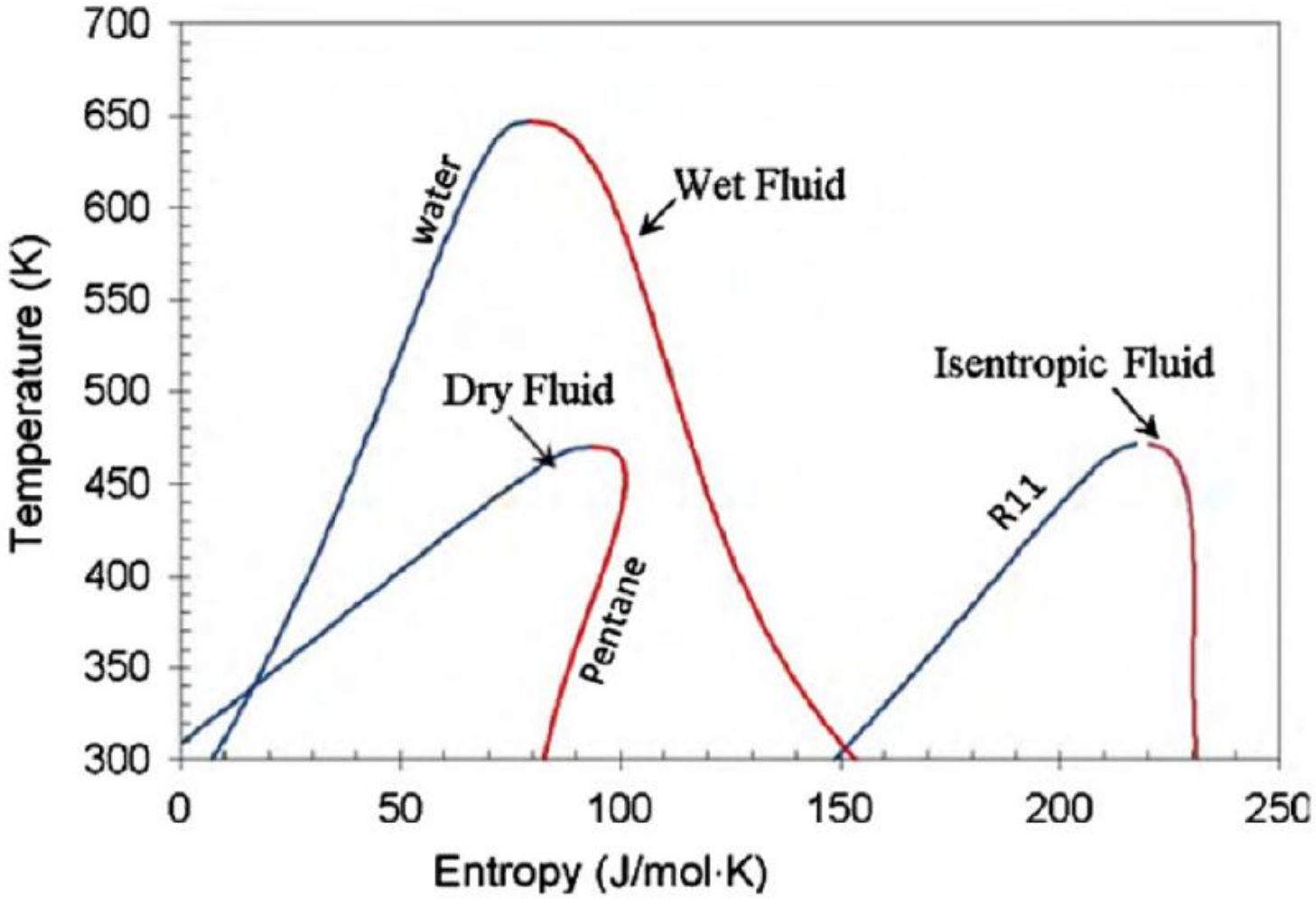
Classified based on their slope in the T-s diagram

Dry fluids (benzene, toluene): $dT/ds > 0$

Wet fluids (ethanol, amonia): $dT/ds < 0$

Isentropic fluids (R11, R134): $dT/ds = \infty$

ORGANIC WORKING FLUIDS



CONTAINER SHIPS

EMISSION	TONS SAVED PER YEAR
CO_2	11.000
NO_x	300
SO_x	200
Particulates	30

EDDI REDUCTION OF A 9.2%

FORMULA ONE CARS

MGU-K + MGU-H + ES → TOTAL RECOVERY OF 95% OF WASTED ENERGY

CONCLUSION AND FUTURE WORK

Introduction of WHRS in technologies increments efficiency

Less contamination to the environment

Enormous improvement in a short period, up to what point will we be able to arrive?

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