

Performance and economic analysis of air conditioning system driven by pneumatic engine

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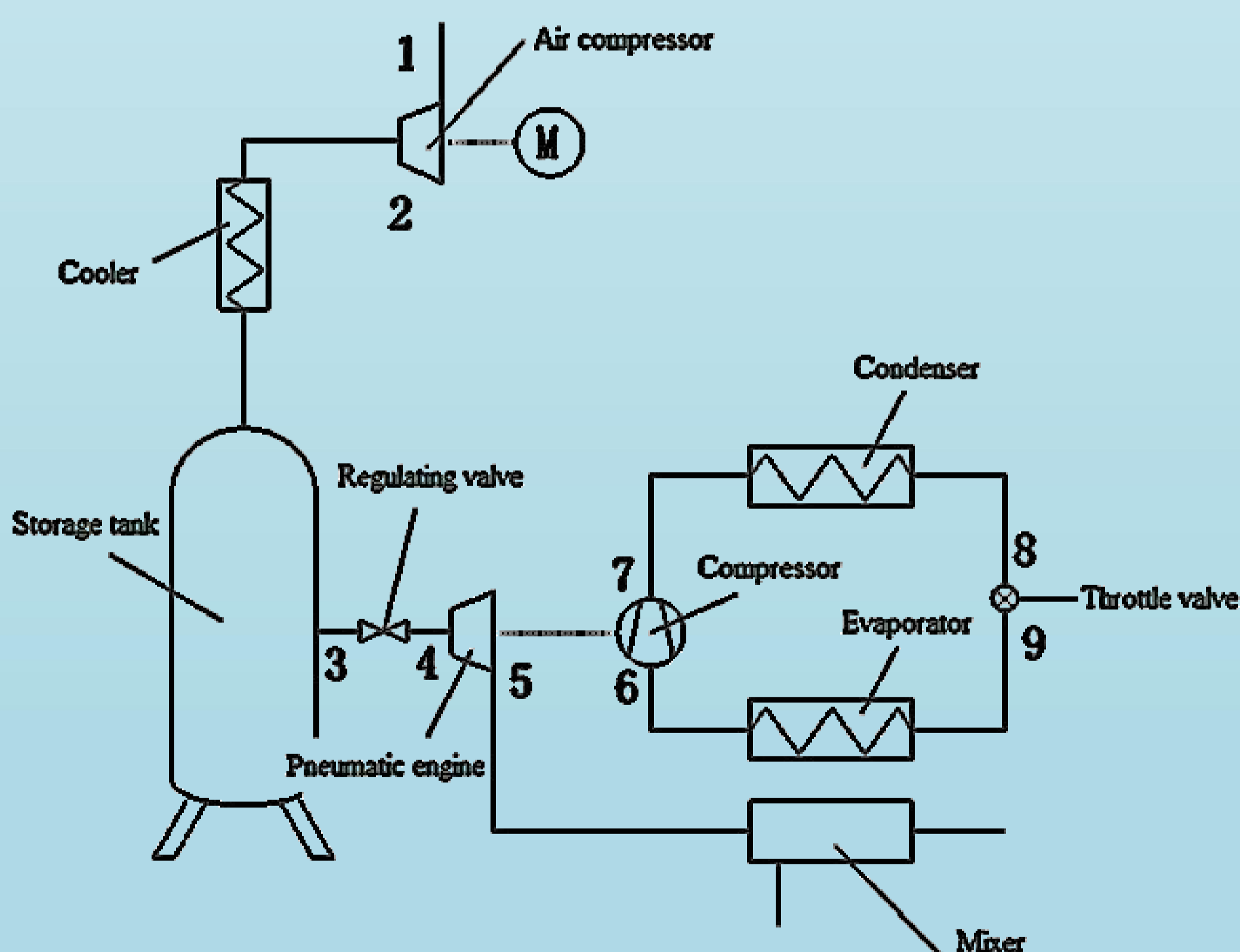
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INTRODUCTION

- Most air conditioning systems' peak period of energy consumption is daytime and the off-peak period is night.
- At present, Chinese society is trying to change the traditional form of energy supply and take positive actions to be carbon-neutral, all links from energy development to utilization.
- One way to make rational and efficient use of power is to store energy. Abundant compressed air is stored in some form and released to the air conditioning system during the day.

METHOD

The system driven by a pneumatic engine is mainly divided into the energy storage unit and refrigeration cycle unit. The air compressor only operates at night, and sufficient compressed air is stored in the storage tank to supply the working demand of the engine during the day. The exhaust temperature of the engine is low, which can be mixed with the indoor air and directly used for space cooling.



The refrigeration system driven by a pneumatic engine

Taking Beijing as an example, the system performance and operation economy were evaluated.

City	Outdoor design parameters	Indoor design parameters
Beijing	Outdoor dry bulb temperature of air: 33.2°C. Daily average temperature: 28.6°C. Outdoor wet bulb temperature: 26.4°C.	Indoor dry bulb temperature: 24°C. Indoor relative humidity: 60%.

DISCUSSION

The power consumption time of the system scheme is different from that of the electrically driven system scheme. According to the peak to valley electricity price policy in Beijing, combined with the operation period, the operation economy of the two system schemes can be compared.

Period	Price
Off-peak	0.2939 ¥/kW h
Over-peak	1.4223 ¥/kW h
On-peak	1.293 ¥/kW h
Mid-peak	0.7673 ¥/kW h

The air conditioning system operates according to the daytime working time of 9 hours. The daily electricity cost was saved by 170.89 ¥, and the operation cost was reduced by 56.64%.

Scheme	Cost
Pneumatic engine driven system	130.79 ¥/day
Electrically driven system	301.68 ¥/day

CONCLUSION

The scheme of refrigeration and air conditioning system driven by the pneumatic engine has a high economic value. At the same time, it can alleviate the tense situation of energy supply in peak hours.