

EEEN313/ECEN405

Introduction to Power Electronics and Electric Drives

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Basic Questions

- What's Power Electronics?
- What are Electric drives?

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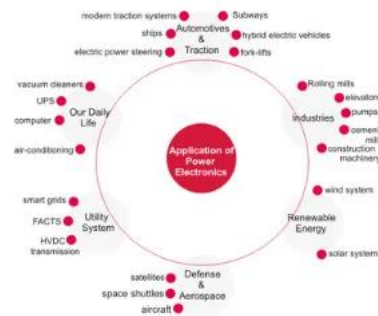
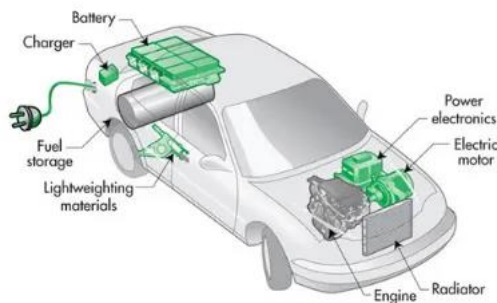
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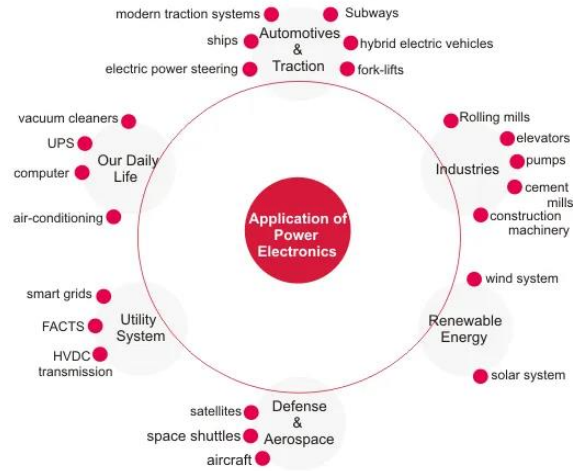
Basic Questions

- What's Power Electronics?
 - Electronics to convert power from one form to another
- What are Electric drives?
 - Conversion of power from electrical to mechanical (and vice versa)

Applications of Power Electronics



Electrical 4 U



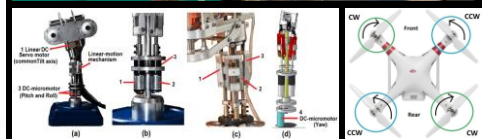
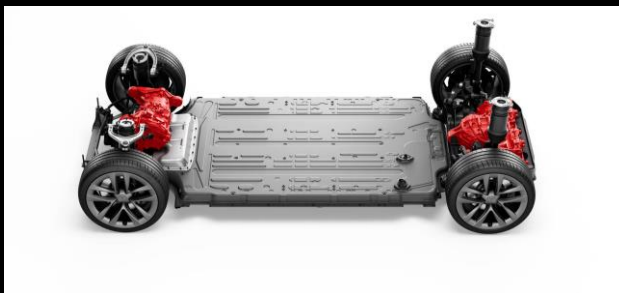
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Electric Drives - Applications



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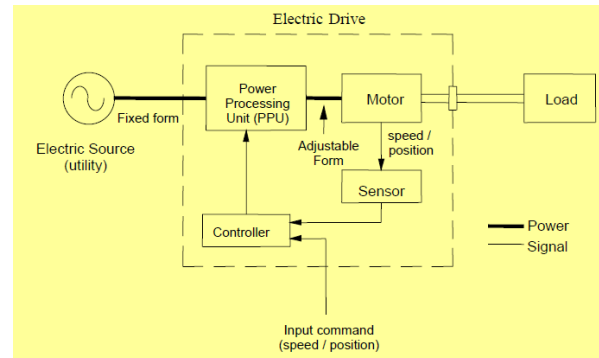


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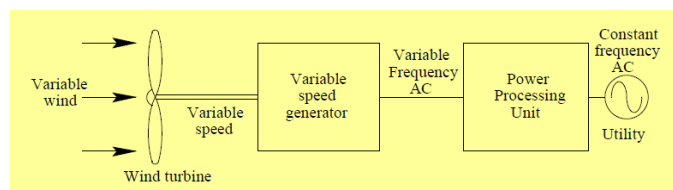
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Role of Electric Drive

- Conversion of power from electric to mechanical (and vice versa)
- Power Electronics (PPU): Deliver the required voltage and current (and also frequency if needed) to the machine

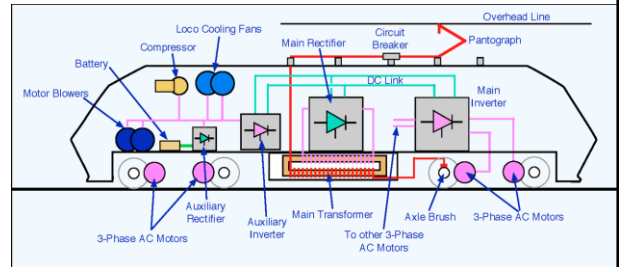
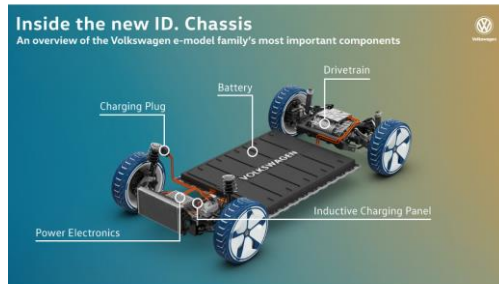


Harnessing Wind Energy



- Types:
 - PMAC
 - Induction
 - Doubly-fed Induction
 - Synchronous

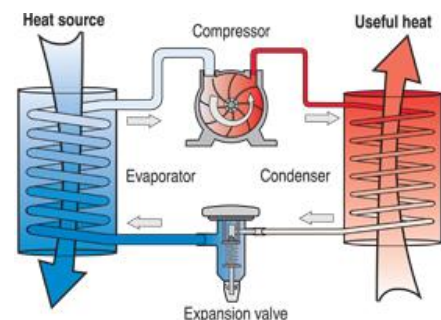
Transportation



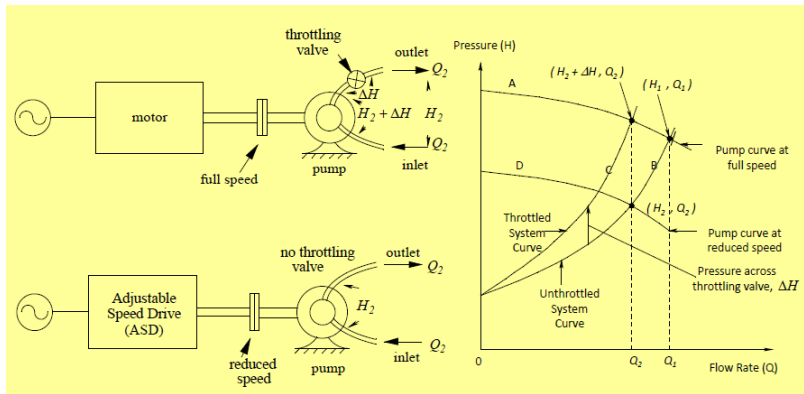
- Electric Trains, Airplanes, Ships – more move towards zero carbon
- Electric Vehicles, PHEVS, Hybrid-Electric – Cars, Buses, Trucks

Energy Conservation

- Heat Pumps, Air Conditioners, Refrigerators
- 30% improvement in efficiency by running the compressor controlled by adjustable speed drive (ASD)



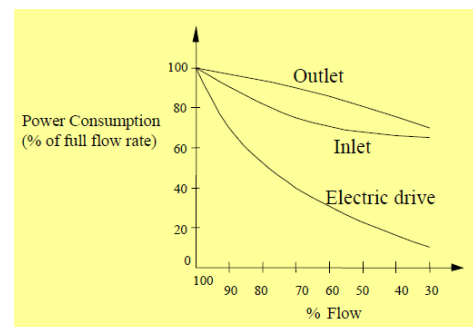
Energy Conservation in Pumps



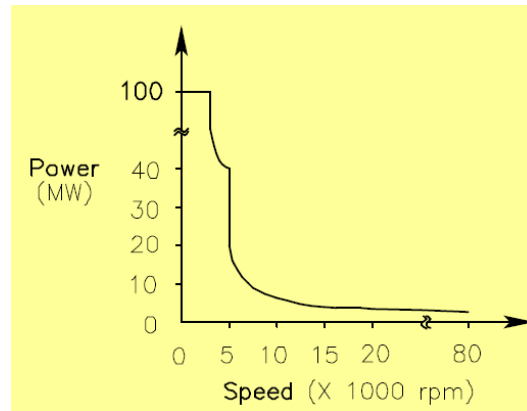
- Throttling introduces extra pressure drop
- ASD control pump speed to load requirement

Blower Systems

- Non power electronic solutions consume more power



Wide Range of Power and Speed



Multidisciplinary

Theory of Electrical Machines

Power Electronics

Control Theory

Real-time Control with DSPs

Mechanical Systems modelling

Sensors

Utility Grid – Drives interaction

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