

**Power Electronics systems** form increasingly large and important parts of any industrial power system. Power electronics are present in variable speed drives (VSD), uninterruptible power supplies (UPS), thyristor controlled heaters and many other systems. In offshore electrification projects (power from shore) and in connection with very large VSD, technologies previously typical only in transmission grids may also come into play in industrial power systems: High voltage direct current (HVDC) transmissions and static VAR systems (SVS) such as static VAR compensators (SVC) or static compensators (STATCOM).

The use of power electronics systems are mostly justified by substantial benefits over conventional systems. VSD systems provide large energy savings, improved process control and reduced machine wear compared with conventional systems; UPS systems provide power to critical consumers during power outages; HVDC systems provide long distance power transmission where AC systems cannot reach or where the grids at each end are not synchronized; and SVSs provide reactive power compensation and voltage stabilization.

However, power electronics systems also present challenges, for example harmonics which are a concern with respect to electromagnetic compatibility and resonances. The operating characteristics of power electronics systems are in many cases quite different from those of conventional systems so that modified operation and protection strategies may be required. Some power electronics systems are sensitive to disturbances and may trip to prevent equipment failures even upon disturbances that many conventional systems might ride through.

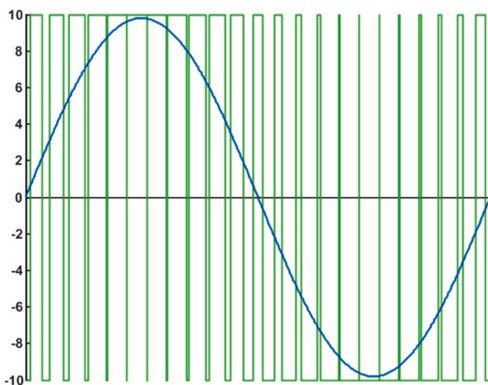


Fig A: The principle of Pulse Width Modulation, the basic modulation principle used in many drives and some VSC HVDC transmissions

Unitech Power Systems provides competence and knowledge of power electronics systems, their application in industrial power systems, and design of power systems in which power electronics systems are key components. This knowledge is routinely used in all our projects in which power electronics systems are present but not necessarily the main topic of the study.

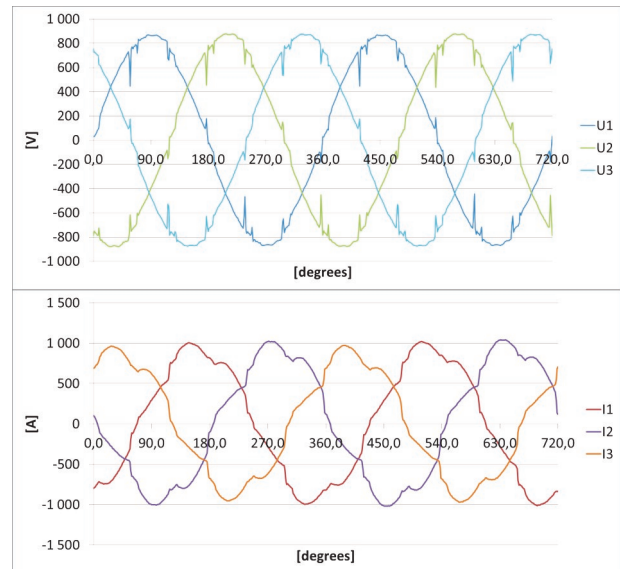


Fig B: Voltage and current wave forms caused by thyristor rectifiers, measured on a drilling rig in the North Sea

In some of our projects, power electronics are the center of attention. Examples of projects in this category are:

- Technology assessments
- Nuisance trip investigations
- Harmonics - measurements and analyses
- Failure (root cause) investigations
- Specifications
- Bid evaluations
- Operation philosophies
- Design and development

Contact us for more information and to discuss how we can serve your needs.

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## Technology and application areas

HVDC	DRIVES	POWER CONVERSION	RENEWABLE	SVS
<ul style="list-style-type: none"> <li>• Classic</li> <li>• VSC</li> </ul>	<ul style="list-style-type: none"> <li>• Control</li> <li>• Passive and active front-end</li> <li>• Multi-drives</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency converters</li> <li>• Power supplies</li> <li>• DC grids</li> </ul>	<ul style="list-style-type: none"> <li>• Wave</li> <li>• Tidal</li> <li>• Wind</li> <li>• Photovoltaics</li> </ul>	<ul style="list-style-type: none"> <li>• SVC</li> <li>• STATCOM</li> </ul>

## Selected project references

**Year: 2013-**  
**Customer: Statnett**

### NordLink HVDC Interconnector (Norway – Germany)

Participation in the technical bid clarification and evaluation for the world's first bipolar 515 kV (DC) VSC HVDC transmission.

Participation in various system studies including converters, >50 km parallel DC and AC overhead lines (in Norway), and >550 km submarine plus underground (in Germany) cables

**Year: 2010-2013**  
**Customer: Langlee Wave Power**

### Wave power generator system

Technology assessment and selection for wave power generator system

Advisory services during prototyping and testing of generator system

**Year: 2013-2014**  
**Customer: ABB**

### VHV motor failure

Participation in root cause analysis (RCA) team with Troll A operator and Very High Voltage motor vendor

Measurement and analysis of variable speed drive, very high voltage motor voltage and current wave forms

**Year: 2012-2014**  
**Customer: ABB**

### Control and firmware development

Development of control strategy for LV Drive

Development and maintenance of control and firmware for frequency conversion equipment

**Year: 2012-2013**  
**Customer: Aker Solutions**

### Design reviews

Review of designs for power supplies for actuators