

Wim van der Merwe, ABB Switzerland

Medium Voltage Drives

Design Considerations in Demanding and Special Applications

Table of Contents

1. Introduction
2. Typical system requirements
3. Designing a special purpose drive
4. Interesting examples

Medium Voltage AC Drives

Markets served



Mining and minerals



Chemical, oil and gas



Marine



Metals



Cement



Power



Water



Special applications,
e.g. test stands

Industrial and General Purpose Drives Introduction

- All sectors have relatively simple applications:
 - Fans, pumps etc.
- Main argument for using a MV drive is process efficiency and removing mechanical regulation devices
- The improvements in process quality is also a big driver

However:

- Reliability, availability, etc. are important
 - But maybe less so: often the drive can be bypassed in case of emergency
- This portion of the market is very cost driven

Industrial and General Purpose Drives Introduction

- Drives in this segment are mostly:
 - IGBT based
 - 2 Quadrant
 - Square torque loads
 - Driving DOL machines or machines with nominal frequencies in the range 50 or 60 Hz



Special Purpose Medium Voltage AC Drives

Markets served



Mining and minerals



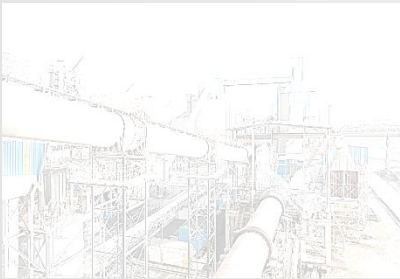
Chemical, oil and gas



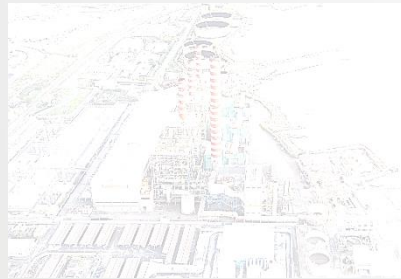
Marine



Metals



Cement



Power



Water



Special applications,
e.g. test stands

Special Purpose Drives

Introduction

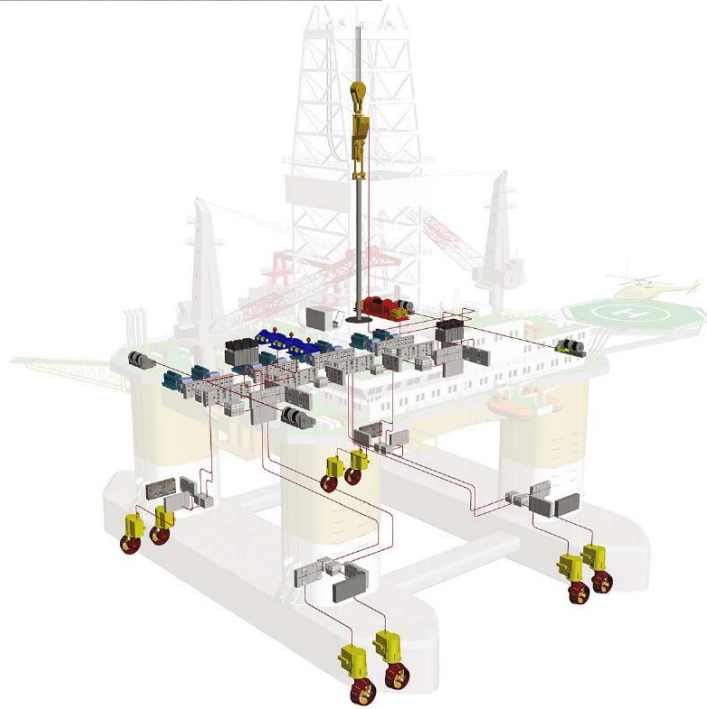
- Special purpose drives can not be replaced by DOL machines
- The drives are critical to the system operation and availability and reliability are often critical. When the drive stops operation the process often stands
- Quite often the machines are specially designed and optimised for the process
- Drives and systems are engineered to order according to customer specifications
- Constant torque, four quadrant operation and wide field weakening range requirements are common

Special Purpose Drives Markets: Marine

Propulsion



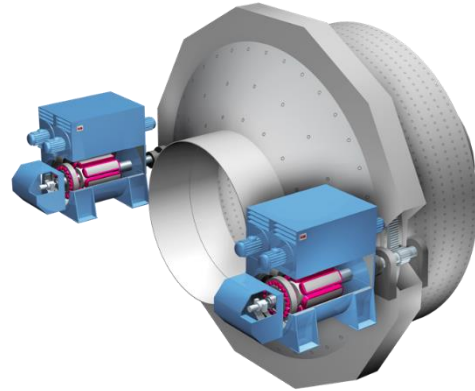
Dynamic Positioning



Special Purpose Drives

Markets: Minerals and Mining

Grinding mills



Mine hoists



And more...



Special Purpose Drives Markets: Metals

Hot rolling mills



Profile mills



Cold rolling mills



Drive System Requirements

Special Purpose Drives Requirements

Availability

- **Network event ridethrough**
 - Drive must remain connected even if there is a temporary short circuit on the supply network
 - Severe power quality events (+20% and -25% voltage fluctuation requirements are common). In special cases even more is possible
 - Unbalanced grid conditions
 - Very weak grids
- **Redundancy**
 - Operation must be guaranteed even with a hardware failure
- **Fuseless design**
 - Fuses are prone to ageing and nuisance trips



Special Purpose Drives Requirements

Safety

- **Arc proof design**
 - No danger to operating personnel irrespective of fault condition
- **4 Quadrant braking capability**
 - Crash stop: Marine
 - Mine hoists
 - Conveyors, especially down hill
- **Safety functions**
 - Safe torque-off
 - Emergency off / stop
 - etc.



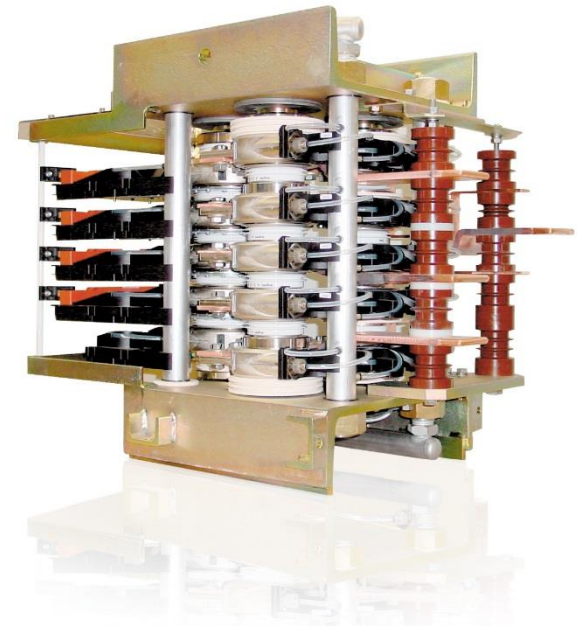
Special Purpose Drives Requirements

High dynamic performance

- **Ridethrough**
 - Very fast reversal of torque to keep dc link charged using process kinetic energy
- **Process Requirements**
 - Metals rolling plants
 - Marine propulsion: ice breakers

Maintenance

- **Quick repair times**
- **Containment of the fault energy**



Special Purpose Drives Requirements

Operating conditions

- **Overload**
 - Requirements of up to 300% are common
- **Output frequency**
 - Low frequency operation, 1.75 Hz field weakening point.
 - Rated torque at less than 1 Hz
 - High starting torque
 - Operation up to 5x nominal speed



Form Follows Function

以上内容仅为本文档的试下载部分，为可阅读页数的一半内容。如要下载或阅读全文，请访问：<https://d.book118.com/336241151212010144>