



New level of energy efficiency

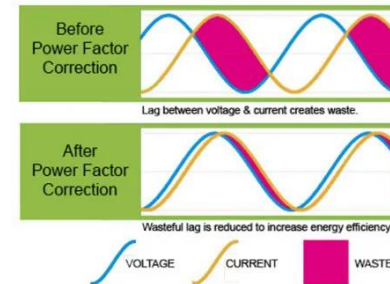
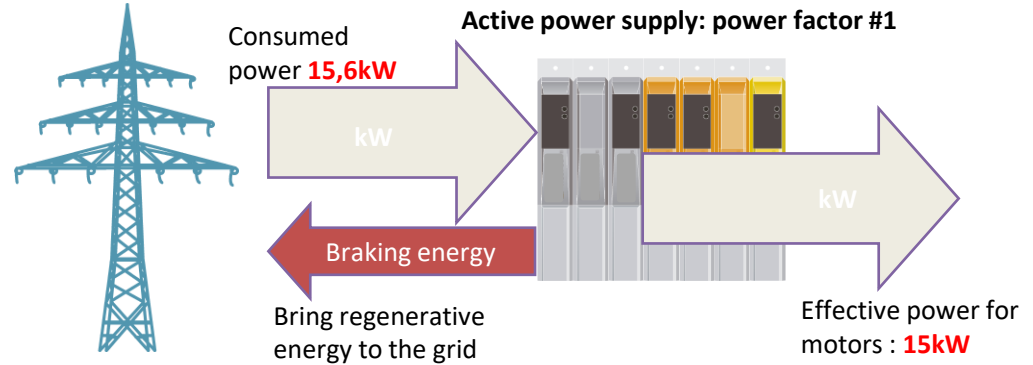
Carlo Cuppini



A member of the ABB Group

Bring the energy back to the grid

- Machine regeneration
 - About 15 to 30%
 - depends on machine cycle
- High voltage DCbus
 - Deduction of current for same power output
 - Motor can rotate highspeed
- Power factor correction
 - Only active power is used
 - No need of cable/transformer/protection oversizing

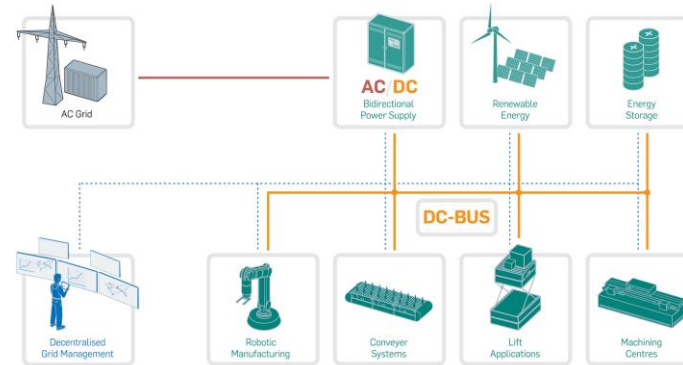


Distributed DCbus across machines

DC power distribution across entire production factory

- ✓ Green energy is natively DC (Solar panel)
- ✓ Battery storage is DC

AC/DC converter are inefficient



Current IGBT Si are reaching technology limit

Pros:

- ✓ Highly available
- ✓ Cost

Const:

- ✓ Loses at high switching frequency
- ✓ No more innovation
- ✓ No more reduction of losses



Evolution of IGBT with SiC MOSFET

Pros:

- ✓ Higher switching frequency
- ✓ Less losses, 1% - 2% more efficient

Const:

- ✓ Volume is driven for automotive/solar panel industry
- ✓ Cost, 3 - 5 times more expensive



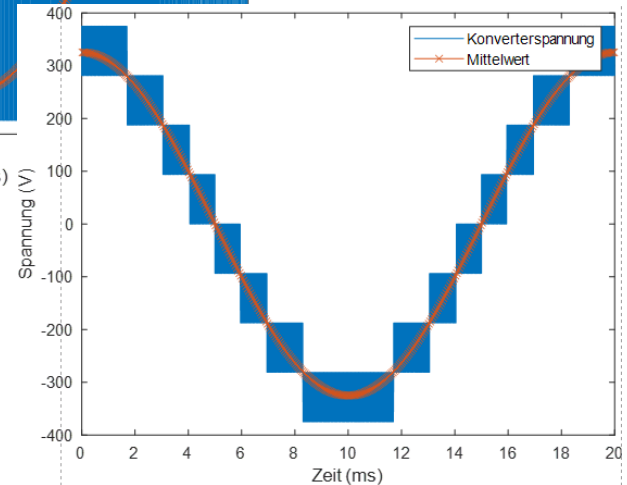
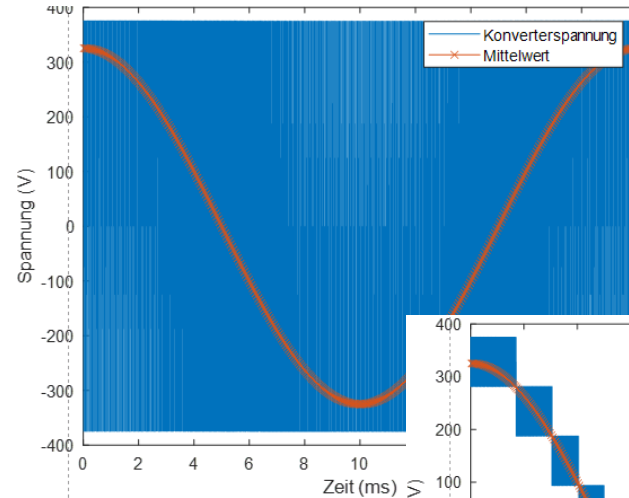
The revolution of Multi level technology

Pros:

- Quasi sinewave voltage generation
- Basic components high available on the market
- Increase of motor efficiency
- Strong reduction of losses into cable
- Strong reduction of EMC
- Strong reduction of leakage currents
- Power regenerative by default (no need of external EMC filter or regeneration choke)

Const:

- Controlling and synchronization of the different level is complex



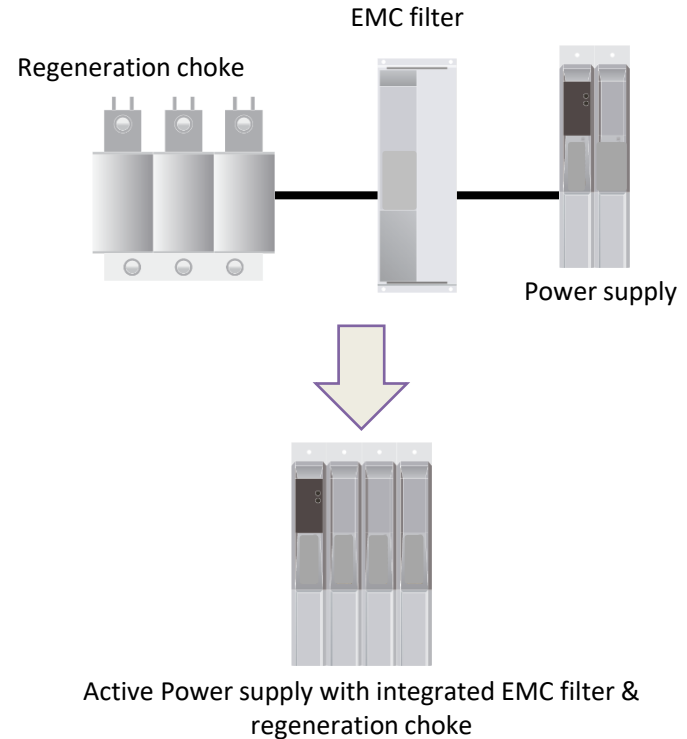
The revolution of Multi level technology

99% of power efficiency

-64% of the system mass vs current market solution

-38% of volume reduction (no EMC filter/regeneration choke)

-39% of losses vs IGBT



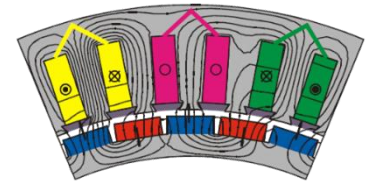
Pole winding

Winding head losses

Filling factor 70-80%

Big pole gap for the winder needle

High cogging because of big slots



Pole winding on single teeth

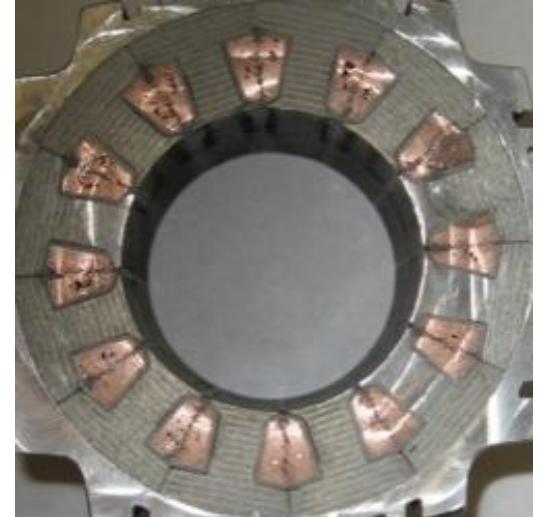
No winding head losses

Filling factor high up 95%

Lower cogging

+45% power density for same size in average

+12% of motor efficiency



Moving the product rather than mechanical parts:

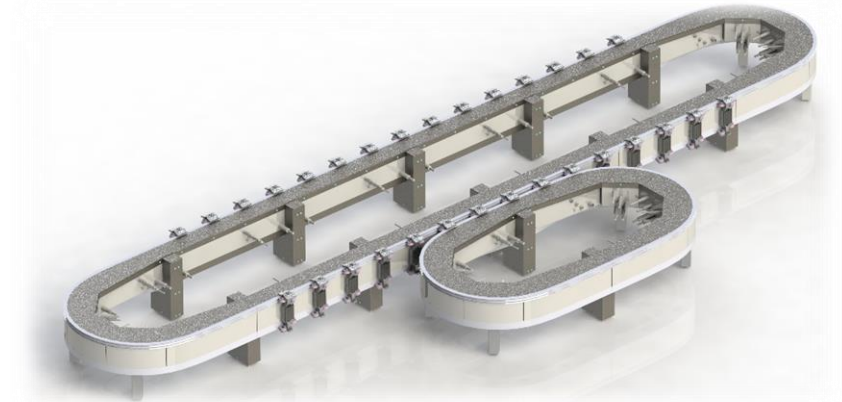
Independent cart transport systems

Magnetic levitation transport systems

Robotic systems

Regenerative solutions low voltage

Substantial energy saving exploiting new technologies to the full, provided that the design habits of machines and plants are drastically challenged





B&R

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