

ABB-PRESS CONFERENCE, 19TH OF JANUAR 2017

Ultra Low Harmonic Drives

For clean network

Fred Donabauer

Ultra Low Harmonic Drives

What are harmonics?

In an ideal case the current in an AC grid is a pure sine wave

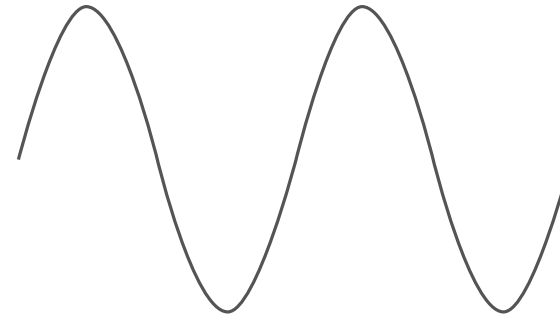
In reality the current deviates from this pure sine wave and contains harmonics

Harmonics distort the sine wave

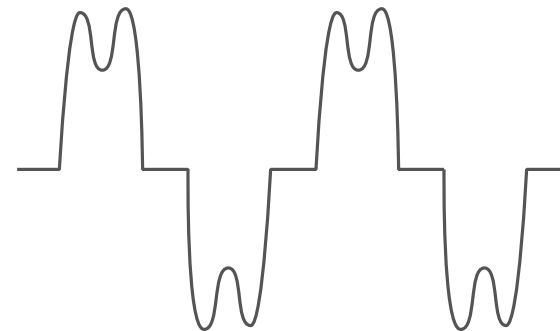
With a traditional frequency converter the amount of harmonic distortion is from 35 % up to 100 %

Sources of harmonic distortion:

- Harmonics are introduced into the grid by non-linear loads, such as motor starters, variable speed drives and transformers



Ideal sinusoidal current



Current with harmonics

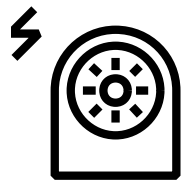
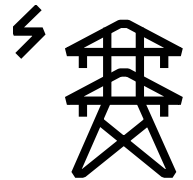
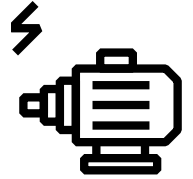
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Harmonics cause disturbances

Harmonics distort the sine wave and pollute the electrical supply

Disturbances caused to the equipment connected to the grid

- motors, transformers, cables and other equipment can overheat
- displays and lighting can flicker
- circuit breakers can trip
- measurement devices can give false readings
- fuses can blow
- sensitive electronic equipment can be damaged
- communications equipment can experience interference
- capacitor can fail due to resonances



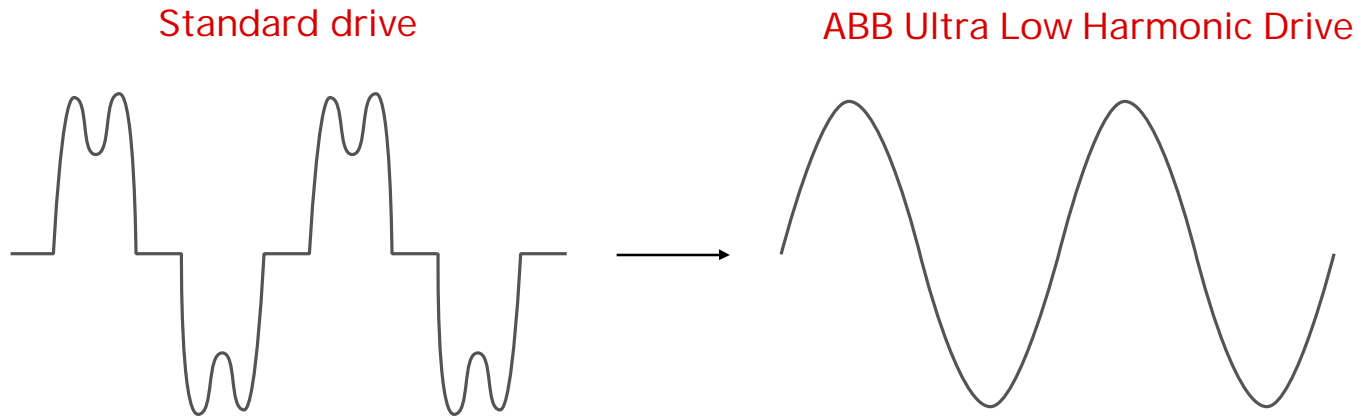
Ultra Low Harmonic Drives

Overcome challenges of harmonics

ABB Ultra Low Harmonic Drives help to keep the power network clean

With harmonics mitigation built into the drive, the Ultra Low Harmonic Drive produces exceptionally low harmonic content. Total harmonic distortion of the current is $< 3\%$.*

Compared to a conventional frequency converter, the harmonic content is reduced even by up to 95 %.



Ultra Low Harmonic Drives

Comparison with multi-pulse solutions

Multi-pulse solution

- Requires a special multi-winding transformer
- Higher cabling and installation cost
- Requires more space and weights more
- Lower power factor
- Effectiveness depends on line imbalance



Multi-pulse solution

ABB Ultra Low Harmonic Drive

- No dedicated transformer required
- Simple cabling and installation
- Power factor unity
- Harmonic performance is robust against supply voltage variations
- Compact design
- Lower transformer losses increase overall efficiency

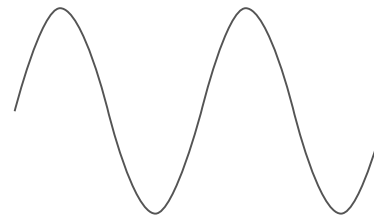


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Comparison with passive harmonic filter

Passive harmonic filter

Requires an additional filter

Current harmonics typically 6 to 10 % (depends on the filter type)

Leading power factor at no load

Load dependent voltage drop over the filter



Passive filter

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Does not require any external parts or cabinets

Current harmonics below limits set by harmonic standards IEEE519 and G5/4

Power factor unity at any load point

Full motor voltage even when the network voltage is low

No risk for resonance

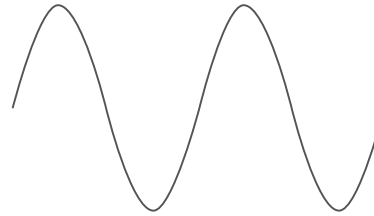


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Ultra Low Harmonic Drives

Suitable for all applications

Compared to a conventional frequency converter,
the harmonic content is reduced even by up to 95 %

Typical harmonic distortion of the current < 3%

Harmonic distortion of the voltage \ll 1 %

Reduced losses and energy consumption of external components

Clean and stable power network

Less unwelcome disturbances

Longer lifetime of equipment

Less maintenance and more uptime

Reliable operation



Ultra Low Harmonic Drives

Comprehensive offering from ABB

Wide power and voltage range,
4 kW to 3,2 MW, 380 V to 690 V

All components integrated into the drive

Excellent all-compatible platform –
learn it once, use it everywhere

Intuitive user interface setting a new
benchmark

Premium motor control

For all industries and applications

- Industrial drives
- Industry specific variants for HVAC and water*



ABB Ultra Low Harmonic Drives

Ultra Low Harmonic Drives

For all industries and applications

Industries

HVAC

Water and wastewater

Power

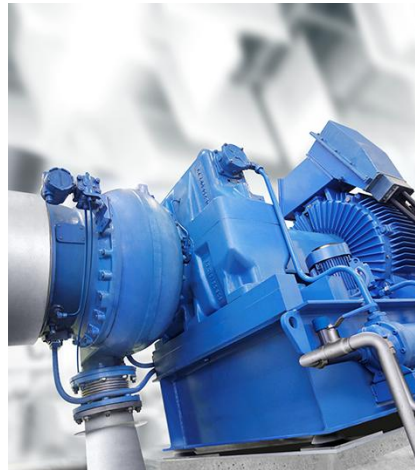
Pulp and paper

Metals and mining

Food and beverage

Chemical, oil and gas

Marine



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The solution from ABB

Harmonics mitigation built into the drive

- No additional hardware needed
- No multi-winding transformer arrangements
- No hidden costs

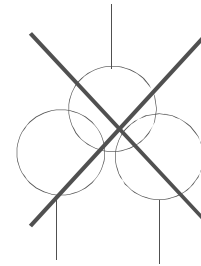
Harmonic distortion of the current typically <3 %

Meets the strict limits of IEEE519 and G5/4

Power factor unity in all load conditions

Full motor voltage even when the network voltage is low

Multi-winding transformer



Passive filter

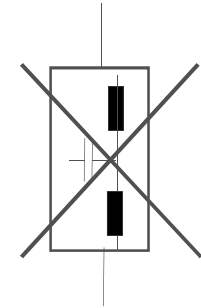
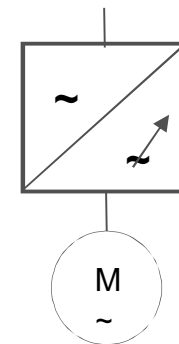


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The solution from ABB

- Complete and compact solution
- Simple installation
- Significant space savings
- Less power cabling
- No external filter needed
- No special tuning to the network required
- Factory tested solution for high reliability

Typical solution

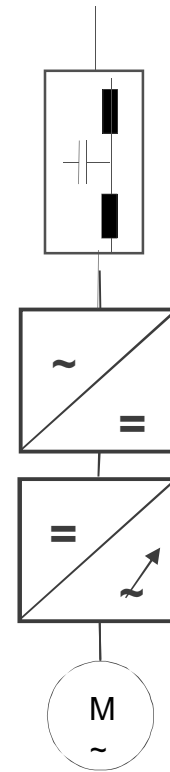
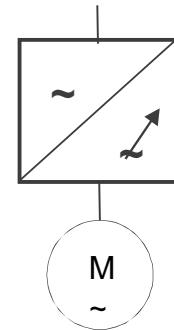


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Prevention is better than cure

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