

Danfoss Corporate HQ at Denmark

Danfoss Established in 1933
90 years of strong growth
Market Leader in core business



Danfoss Group...3 Business Segments



Danfoss Power Solutions

#2 Market position

- 7,826 employees
- 28 factories in 12 countries
- 2.2bn EUR annual sales



Danfoss Climate Solutions

#2 Market position

- 10,792 employees
- 32 factories in 15 countries
- 2.6bn EUR annual sales



Danfoss Drives

#2 Market position

- 4,504 employees
- 10 factories in 7 countries
- 1.5bn EUR annual sales



Danfoss India

Chennai Campus (on 50 acres land)

LEED Platinum rated campus with 10,000 trees around
4000 Employees, 75 Distributors



Research & Testing Facilities

Dedicated Drives lab with testing capacity up to 1MW

TEST BAYS

- Load test up to 1358 Amps @400 V
- Brake test up to 700kW

Certifications

- Bureau Veritas
- UL witness test data program



POWER ELECTRONICS LAB

- Low Voltage Directive
- Performance test
- UL 508C



ENVIRONMENT TEST CHAMBER

- IP test up to IP54

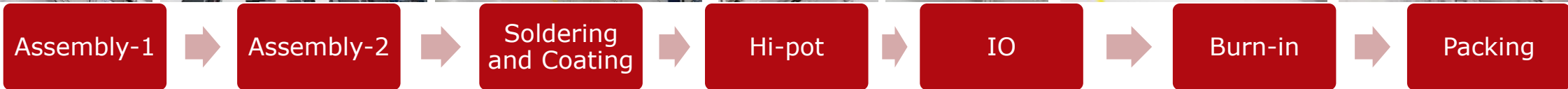


EMC TEST LAB

- EMC pre-compliance test – Conducted emission only



VFD Production line



Engineering Center of Excellence

Solution for all Your Application needs

Danfoss Engineered Panel Solutions have proven their **market leadership with thousands of panel installations**. Our product line today includes **IP42, IP54, IP66 panels**.

Offers customized solutions to customers

- Designing and manufacturing of VFD panel **up to 2 MW**
- Capable of delivering up to **100 panels per month**
- **Full load test capacity up to 690VAC, 710KW**
- ISO 9001:2015 certified (To ensure stringent quality conformance)







Training centre



Decarbonization

WHAT?

Reduction in carbon intensity by lowering greenhouse gas emissions

WHY?

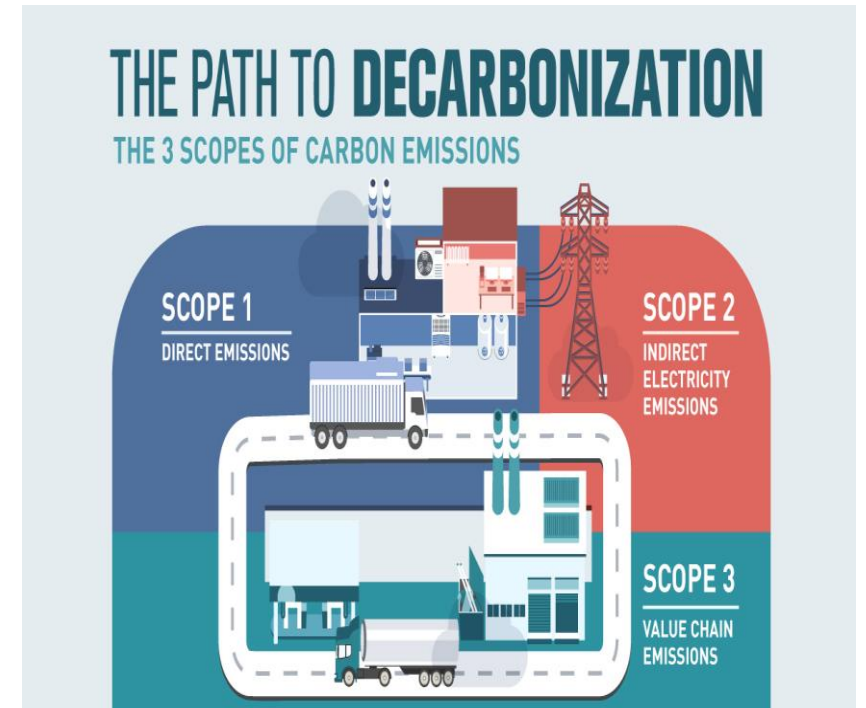
- Tackle Climate change
- 2015 Paris Agreement
- Global imperative and priority for govts, companies & societies

HOW?

- Energy Efficiency
- Electrification
- Carbon Capture
- Decarbonization of Electricity

WHEN?

Various commitments to achieve carbon neutrality by 2030-2050



Decarbonization

- Energy Efficiency continues to play a major role in Industrial Decarbonization journey
- This level may contribute more than 45% of overall Decarbonization.
- Other focus levels are Biomass & other net Zero green energy resources
- Material Circulatory & other advanced technologies
- Danfoss HO already achieved Carbon Neutrality in 2022 and Danfoss India to achieve this status by 2030



Increasing the use of drives will have the biggest decarbonization impact (Illustrative)

CARBON FOOTPRINT



Manufacturing and purchased goods (product creation)



Products in use during lifetime (losses during use ~2%)

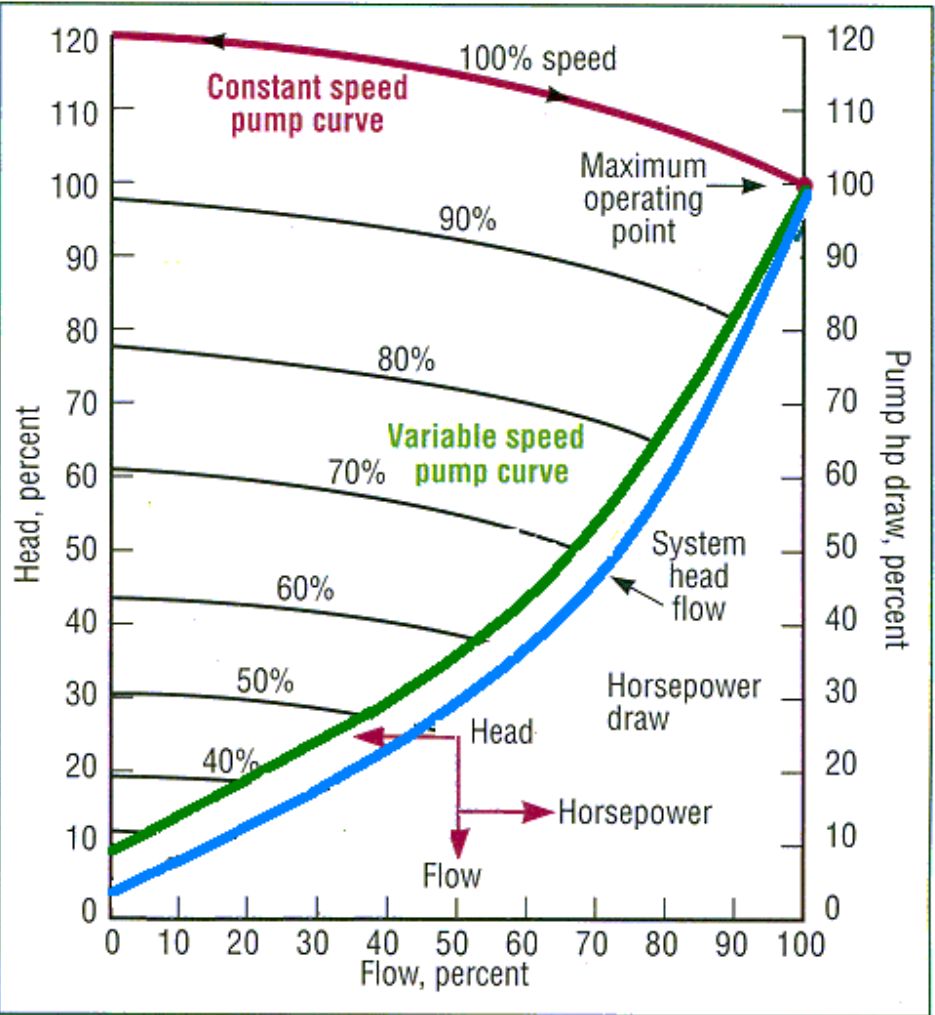
AVOIDED EMISSIONS

Savings of 15-45% in motor driven systems during product lifetime



More drives deployed will help our climate

How do we save energy in Centrifugal Fans & Pumps



Affinity laws for pumps and fans

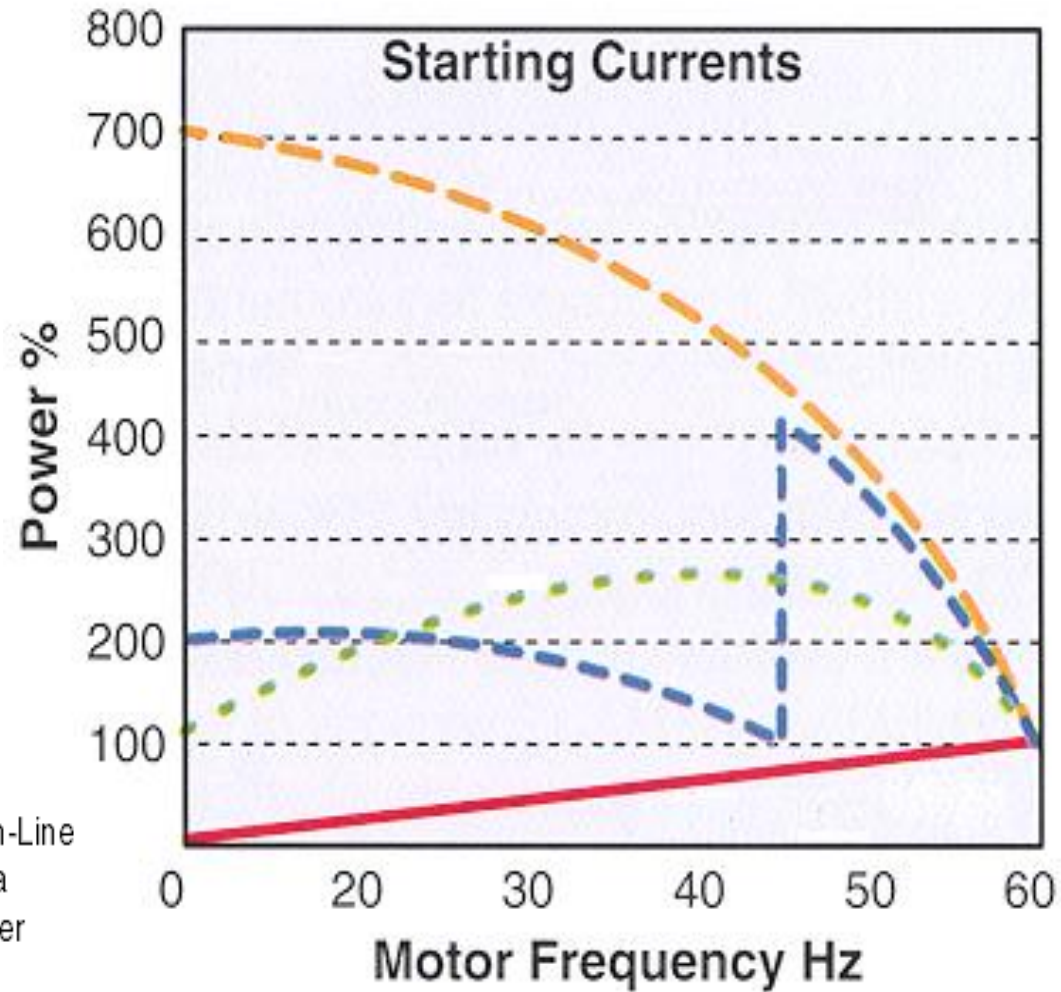
- FLOW \propto RPM
- HEAD \propto RPM²
- POWER \propto RPM³

RPM	FLOW	HEAD	POWER
100%	100%	100%	100%
90%	90%	81%	73%
80%	80%	64%	51%
70%	70%	49%	34%
60%	60%	36%	22%
50%	50%	25%	13%
40%	40%	16%	6%

If Pump Speed is reduced thru VFD to 80% = 0.8
Then
Liquid Flow Rate \propto (0.8) = 80%
Pressure Developed by Pump \propto (0.8 x 0.8) = 64%
Power Consumed by Pump \propto (0.8 x 0.8 x 0.8) = 51%

Therefore with 20% Speed Reduction, the Power Consumption is reduced to 50%

Evolution in Motor Starting Equipment in Pumping



Evolution in Motor starting equipment

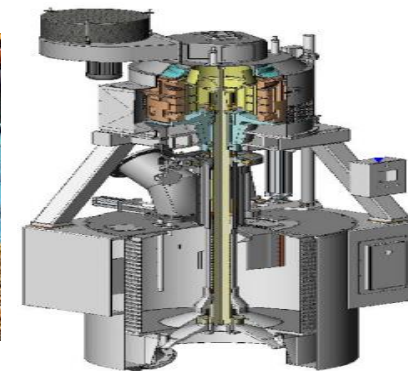
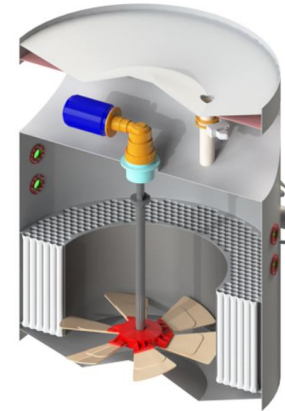
Starting current = Full Load Current

- VFDs allow starting current equal to that of full load current of motor
- Lower Switchgear sizes
- Peak Demand under control
- Smooth start
- Reduction in DG Set capacity requirement

Energy Saving Potential in Sugar

Energy Saving Potential in a Sugar Mill...25%

Type of Pump/Fan	Saving potential	Other Machines	Saving potential
BFWP	20-25%	Mill Crusher	5-10%
Cooling Water Pump	25%	Mechanical circulator	10-15%
Hot Water Pump	20-25%	Dust Collector	15-20%
Pan injection Pump	20-25%	Bagasse Dryer	15-20%
Juice Pump	20-25%	Compressor	10-20%
Seed Pump	20-25%	Cane loader & unloader	5-10%
Messacute Pump	20-25%	Centrifuge	25-30%
SA Fan	20-25%		
ID Fan	20-25%		
FD Fan	20-25%		
CT Fan	20-25%		



Energy Saving Potential in Sugar Distillery...25%

- Stirrer/Agitator (for molasses tank)
- Decanter
- Cooling Tower
- Pumps
 - Fermentation
 - Spentwash
 - Spirit
 - Dosing
 - Feed
- Fans
 - Furnace Blower
 - Boiler ID/FD



Danfoss Technologyalways ahead of others



Conformal coating for Harsh Environment

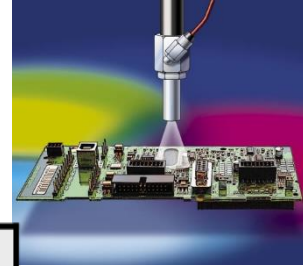
- 3 standards of coating available: 3C1,3C2,3C3
- 3C1: No protection
- 3C2: Provides protection against mild levels of contaminants
- 3C3: Highest level of coating as per **IEC721-3-3 standard**
- 3C3 provides protection against aggressive environments like toxic and non-toxic materials, Hazardous Chemicals , Acidic fumes, Moisture, Bagasse etc.

Advantages of 3C3 Coating

- No premature failure of Drives due to non-avoidable harsh environmental conditions
- More uptime and no production loss
- Increased life span of VFDs by 25%



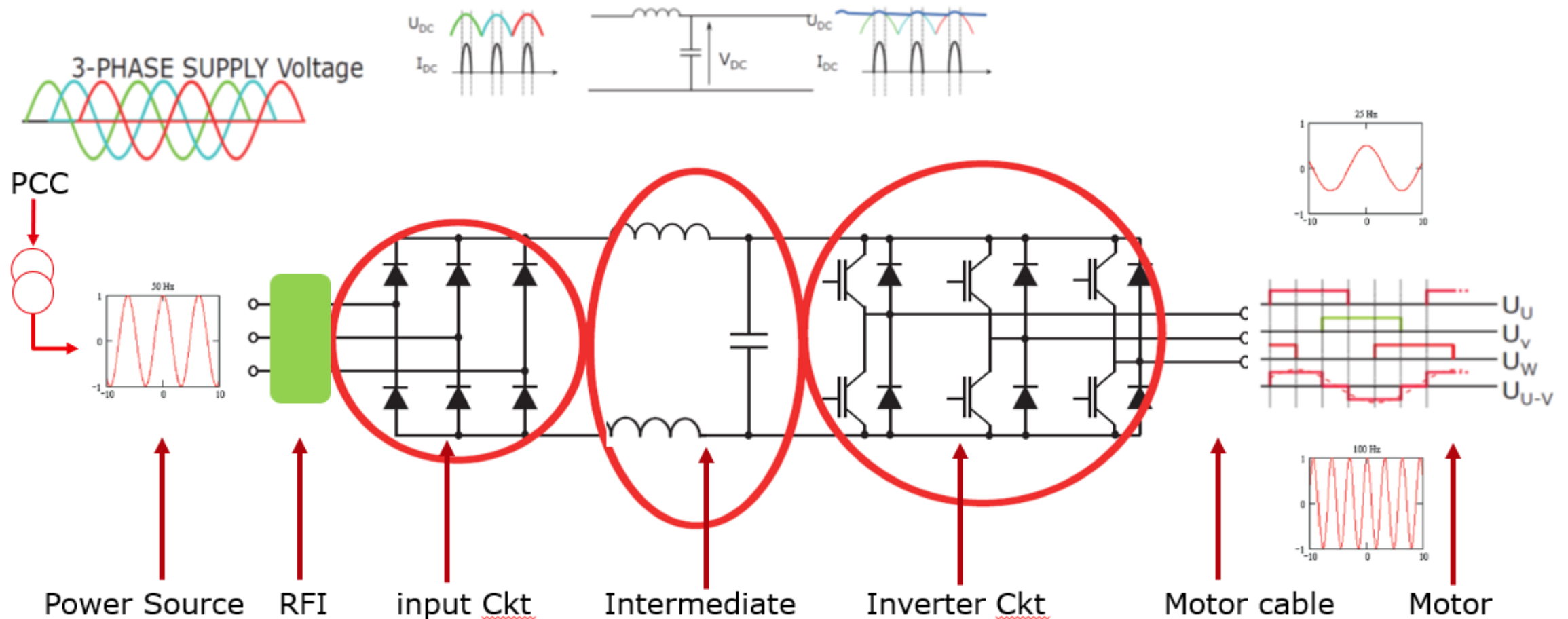
Protection levels of various coating levels against Chemical substances



Environment Parameter	Unit	Class				
		3C1	3C2		3C3	
			Mean value	Max value	Mean value	Max value
Sea salt	mg/m ³	No	Salt mist		Salt mist	
Sulphur dioxide	mg/m ³	0,1	0,3	1,0	5,0	10
Hydrogen Sulphide	mg/m ³	0,01	0,1	0,5	3,0	10
Chlorine	mg/m ³	0,01	0,1	0,3	0,3	1,0
Hydrogen Chloride	mg/m ³	0,01	0,1	0,5	1,0	5,0
Hydrogen Fluoride	mg/m ³	0,003	0,01	0,03	0,1	2,0
Ammonia	mg/m ³	0,3	1,0	3,0	10	35
Ozone	mg/m ³	0,01	0,05	0,1	0,1	0,3
Nitrogen Oxides	mg/m ³	0,1	0,5	1,0	3,0	9,0

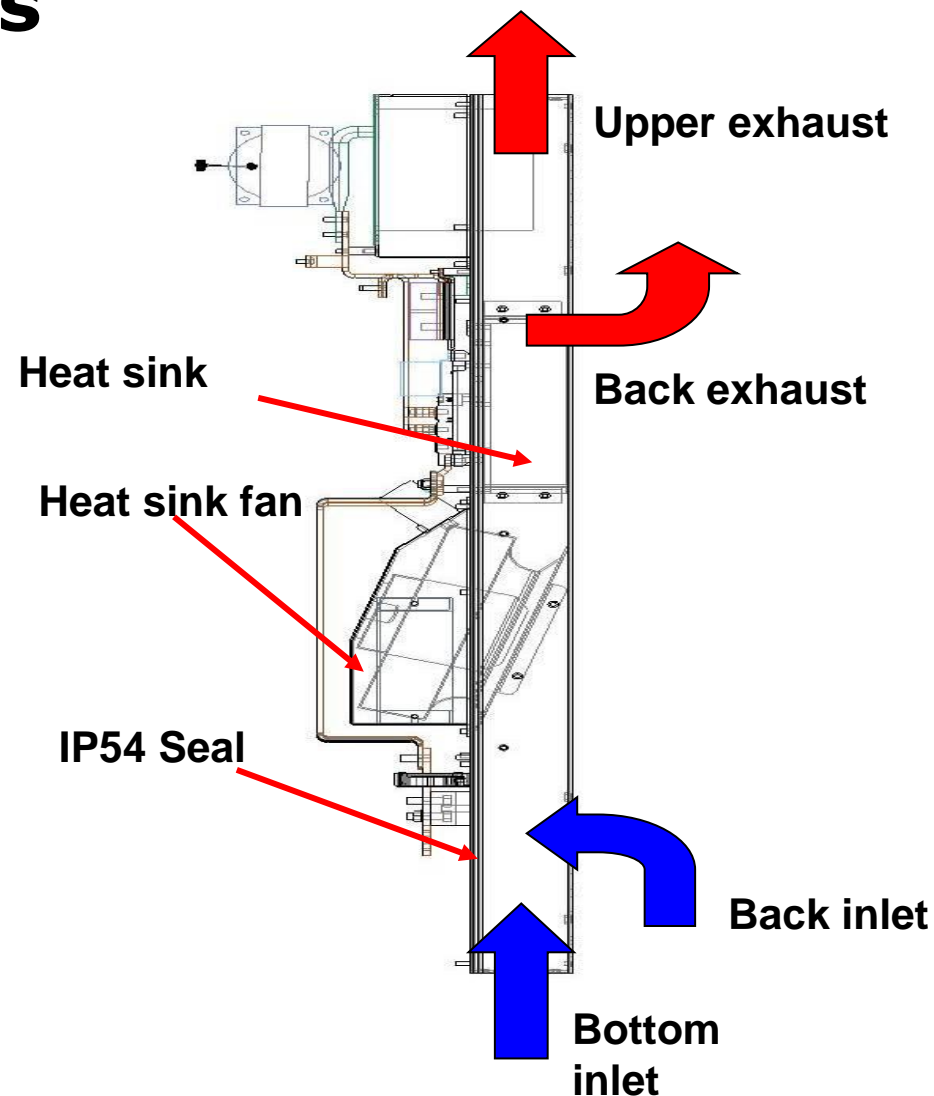
Built-in harmonic filter

- Built-in **DC link Chokes** in both the limbs. Fulfills EN 61000-3-2/3-12
- Reduces installation cost
- Displacement power factor($\cos \varphi \approx 1$). True power factor 0.9



Intelligent Heat Management Back Channel Cooling for HPDs

- Ducted back-channel passes cooling air over the heat sink only
- 85% of the heat generated is removed by the heat sink fan through back channel



Birla Sugar (Upper Ganges) Seora, UP

40MW Cogen using BCC concept



Boiler Feed Pump	400	3
MCW Pump	300	3
ID Fan	250	2
SA Fan	140	2
FD Fan	90	2
CT Fan	90	2
Feed Transfer Pump	55	2
Air Compressor	45	2
Rotary Screw Feeder	7.5	12

One more case of Back Channel cooling



Highest Flexibility

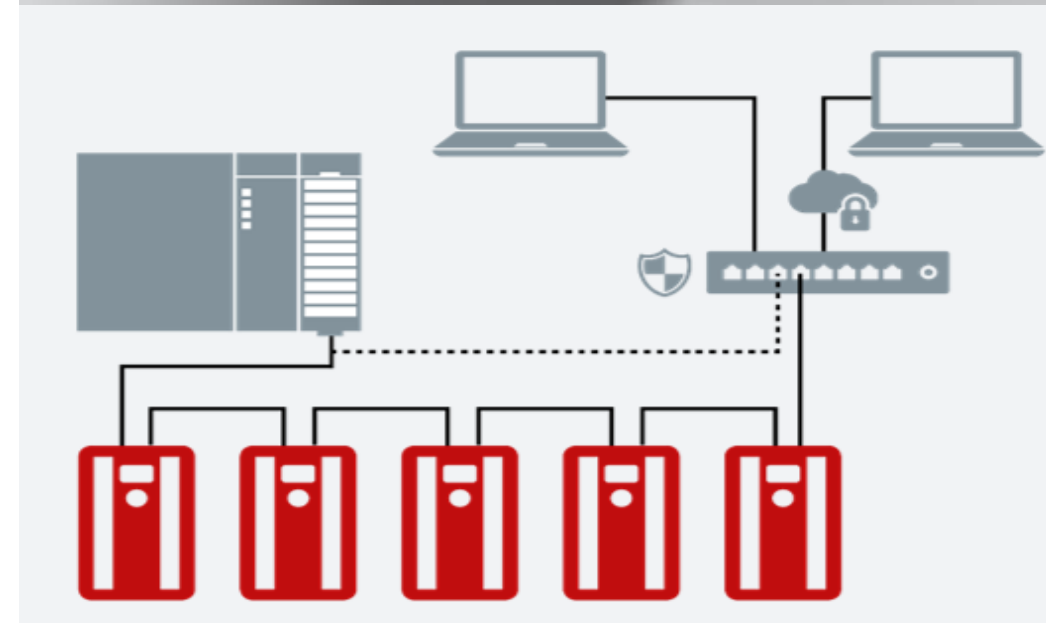
Motor independence: Free to choose any motor technology you like

- Asynchronous motors
- Permanent magnet motors (IPM and SPM)
- SynRM and PMASynRM motors

Field Bus options

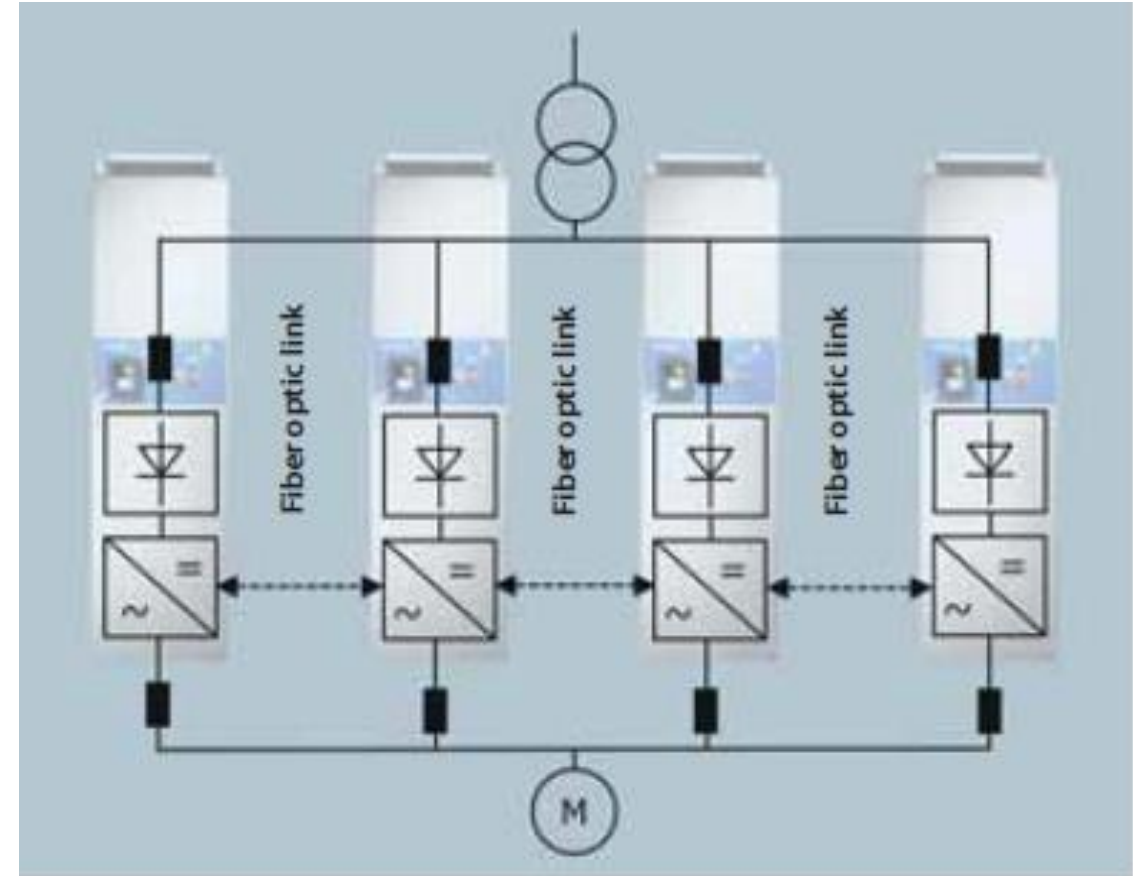
- PROFINET®, PROFIBUS DP-V1, DeviceNet, EtherNet/IP, EtherCAT, POWERLINK®, CANopen and Modbus TCP protocols available
- All Ethernet options feature dual-ports and a built-in switch for **ring topologies**

Central/Decentral solutions

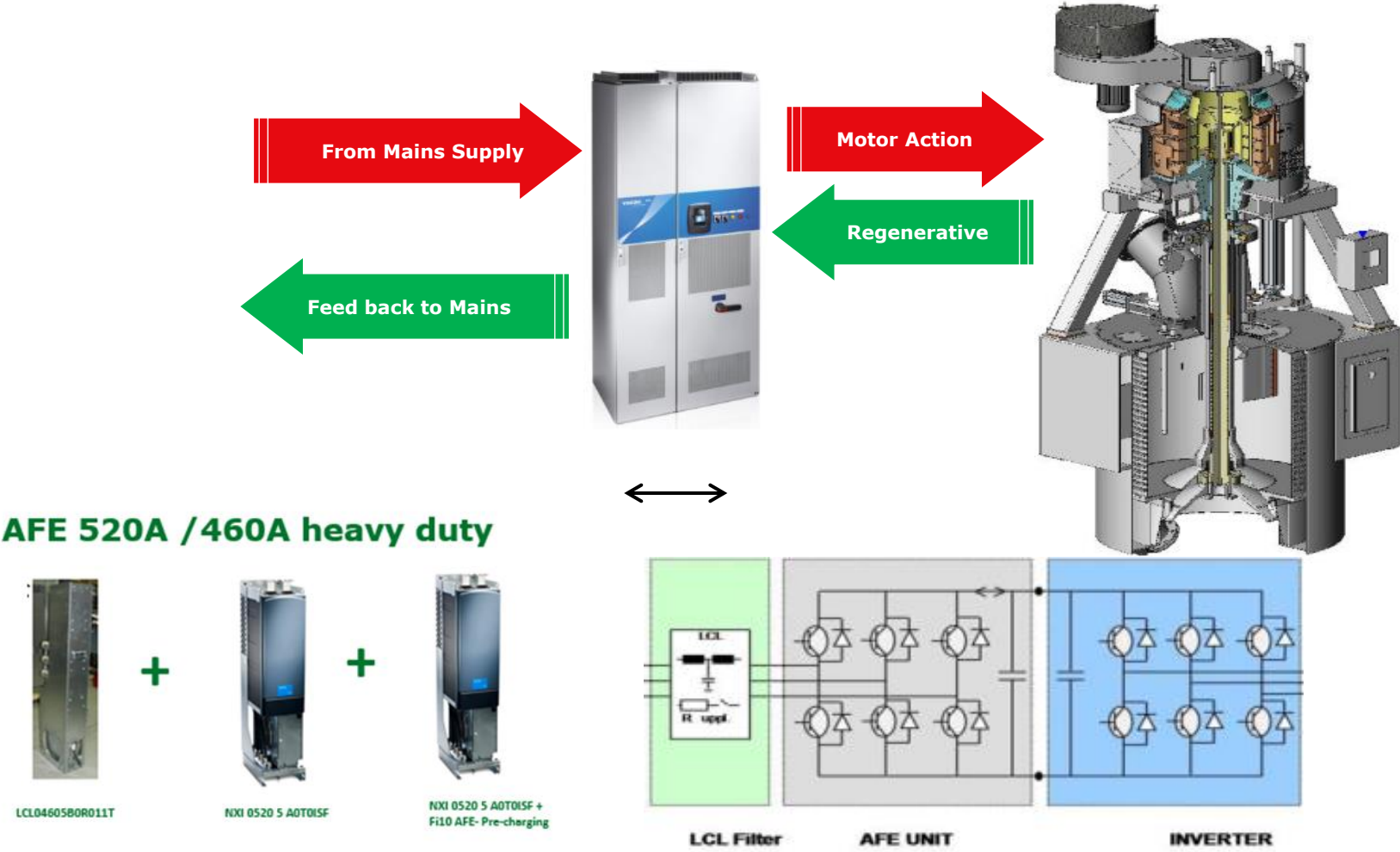


Danfoss NXP Solution for Mill Application

- High Power can be obtained by combining smaller drives
- Modular system which is expandable any time as per the capacity requirement
- Higher System redundancy than in a conventional drive as each unit can run independently
- No down time. Mill will always be running
- No dip in crushing rate
- Lowest operational and maintenance cost: Individual drive is easy to maintain and service
- 75 to 85% reduction in inventory cost. Need to maintain a smaller unit and not entire drive.



Centrifuge Solution with VACON Active Front End-Line Regenerative



Intelligent VLT® drive Condition Based Monitoring



Continually monitoring of;

Stator winding

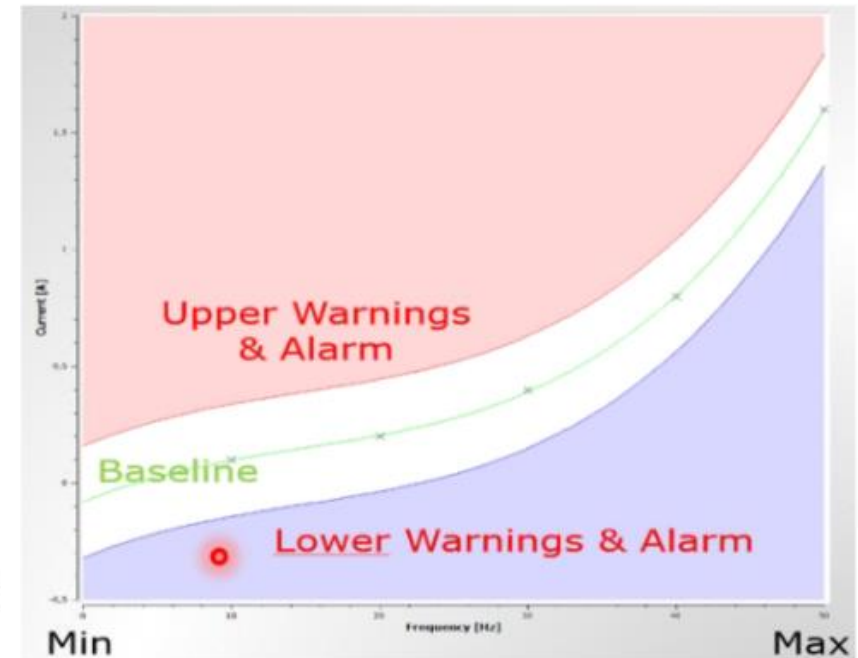
- By analyzing the motor current signature, the drive can detect motor winding damage at early stage.

Load envelope

- The function learns the load curve of the application & detects whenever the load moves above or under the expected level.
- Friction in machines, fouling, sanding, broken impeller or wear-out of pumps or clogged filters and leakages in ventilation system.

Vibration (External sensors, Levels according ISO10816)

- Speed related vibration (RMS) to detect unbalance, looseness & misalignment & mechanical resonance.



Summary

- 45-50°C ambientNo breakdown during crushing season
- Highest protection level Class 3C3 coating according IEC60721-3-3. Increased production.
- Built-in Harmonic Filter : DC chokes in both the limbs
- Built-in FRI Filter Class A2
- Built-in Brake Chopper (up to 22kW) for crane application
- Small footprint : Side by side mounting(saves 20% of panel space/ room space)
- Lowest Heat Loss: 20-40% lower heat loss.
- Low AC load: Intelligent Heat management & Low heat loss heavily reduces AC load
- Low running cost
- Dedicated Drives organisation with world class support. Real 24x7 support.

1

Decarbonization

Its real and achievable in
Sugar applications through
Energy Efficiency
Potential of Energy saving:
20-25%

2

Better Process Control
Less Maintenance
Continued Productivity
during the crushing season

3

Process Intelligence
VFDs are no longer simple
power processors; they are
intelligent elements in the
information chain.
We can have now
Remote Monitoring
Cloud connectivity and
Preventive Maintenance



Key takeaways