FlexoDirect®

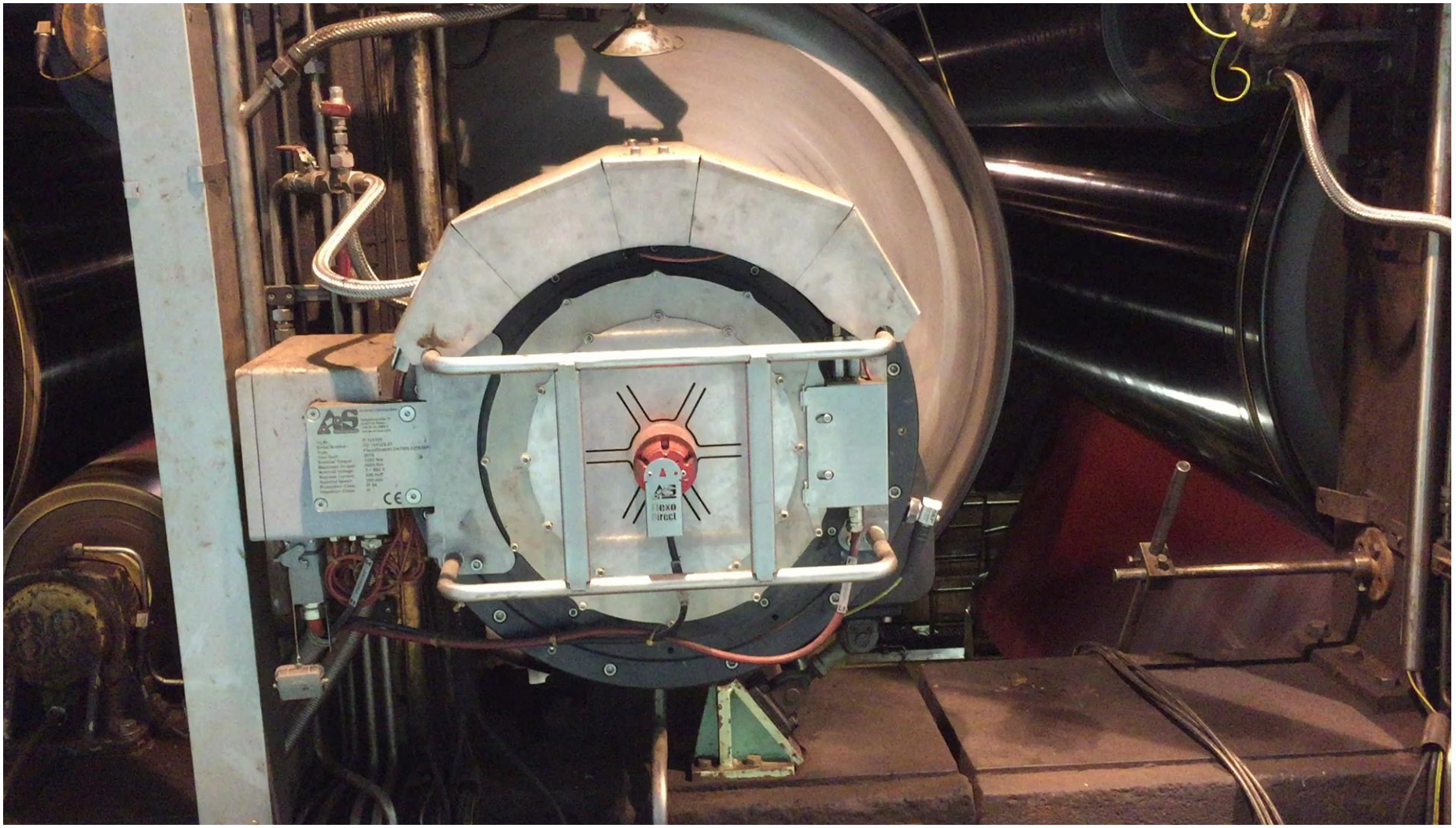
A REVOLUTION IN THE PAPER MACHINE-DRIVE TECHNOLOGY

- R. Ataman, AS Drives & Services GmbH (Sales Director)
  r.ataman@as-drives.com, Phone +49 175 2222 726

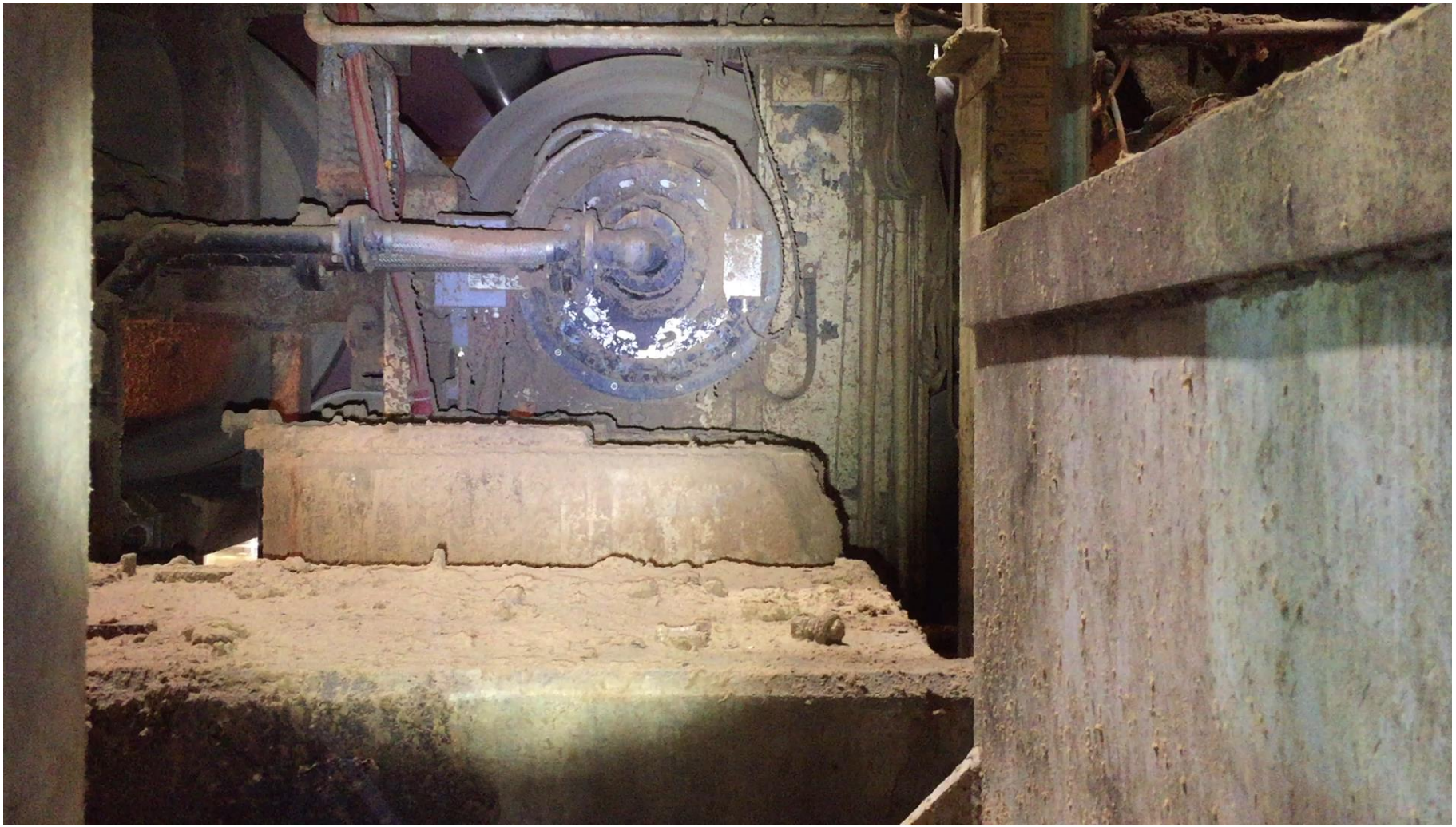
44th International Annual Symposium DITP

FlexoDirect® Mondi Dynäs in Sweden at the drive side installation

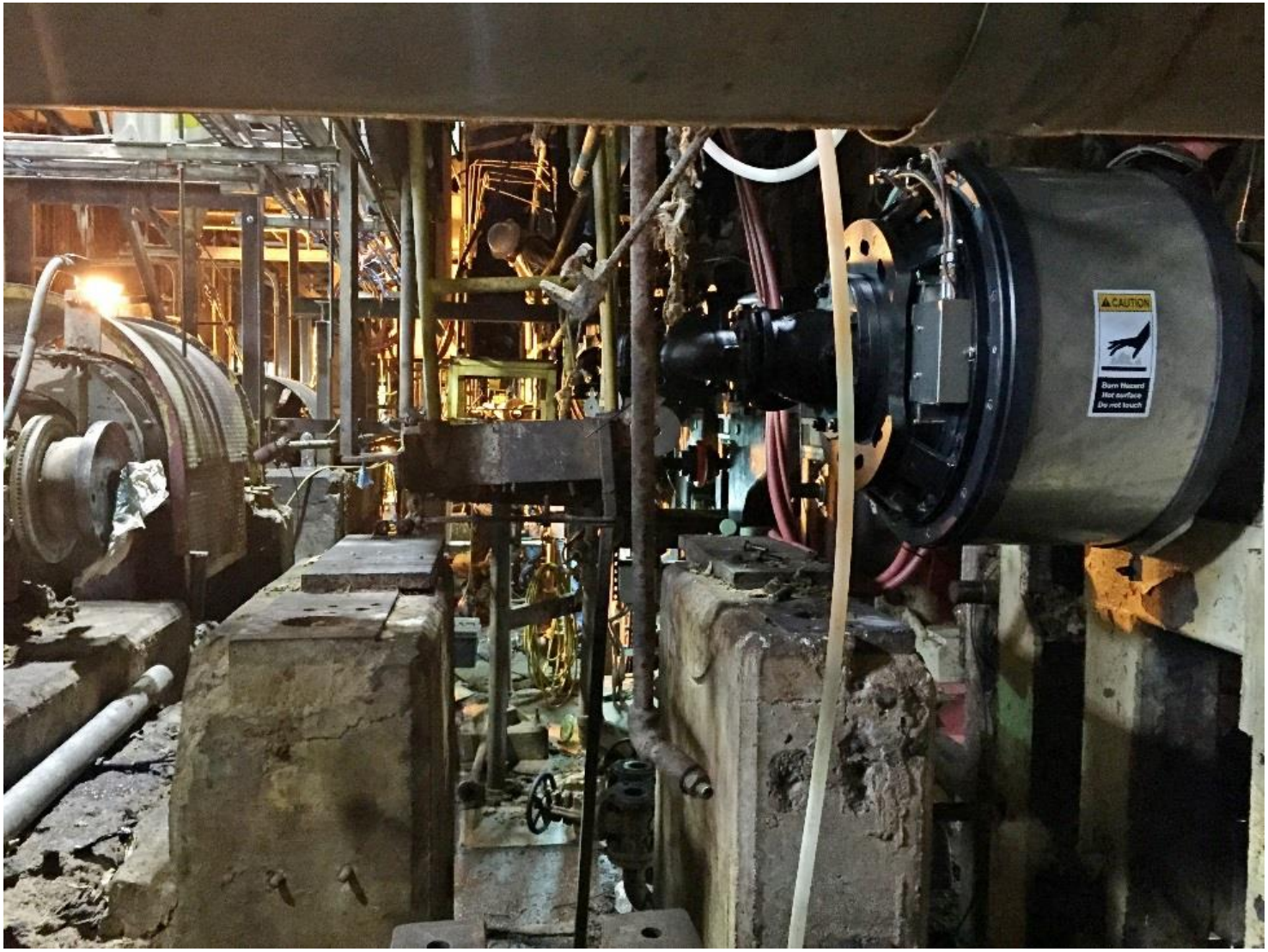
FlexoDirect® Mondi Steti in Czech Republic at the tender side installation



FlexoDirect® Mondi Pine Bluff, Arkansas USA drive side installation

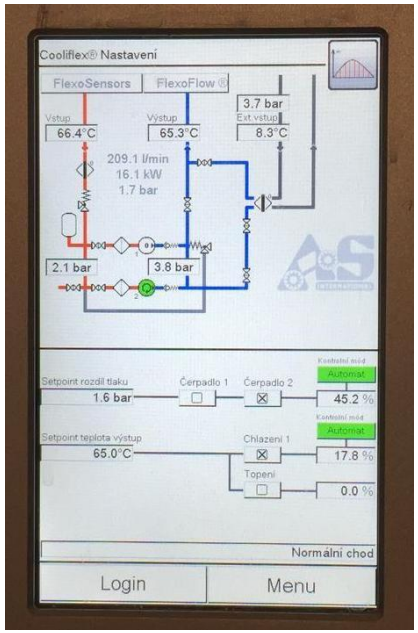


FlexoDirect® Mondi Pine Bluff, Arkansas USA drive side installation



- FlexoDirect® is a water cooled permanent magnet synchronous motor (PMSM)
- three phase hollow shaft motor and is designed for 400VAC up to 690VAC power supply. (0-80 (200 max)Hz.)
- Closed Water Loop (Q=7-16 l/min)
- Special Sealing System with low friction
- FlexoDirect® is maintenance free compare the conventional systems on the market
- Bearing to withstand the environmental and mechanical influence over the period of 100000 hours of operation.
- Patented torque support without any connection to the PM-Frame

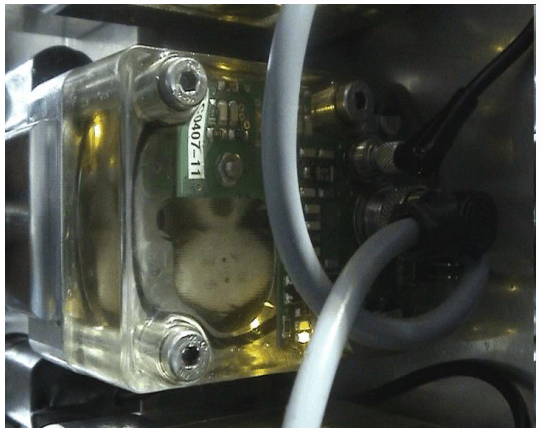
The Cooliflex®



- The Cooliflex® is a tempering unit for the suitable cooling of FlexoDirect® hollow shaft motors.
- The cooling will be realised with water. The used heat exchanger can vary between water/water or water/air exchanger.
- With redundant pump systems the cooling water is contained in a closed circuit and is cooled by a heat exchanger. heating element (if necessary) ensures that the cooling water temperature keep over minimal adjustable cooling temperature.
- Possible plugging or damages by corrosive cooling media will be prevented by adding Additives.

FlowFlow®

Core characteristics FlexoFlow®



- flow rate is readjusted automatically
- independent of viscosity, temperature and pressure
- in this way, the pump pressure could be minimized
- A throttle for all areas of the application 0,05-100 Liter
- Cost-optimized design
- Easy integration
- Bypass function allows maintenance during operations

“FlexoFlow®” – the watchful flow controller

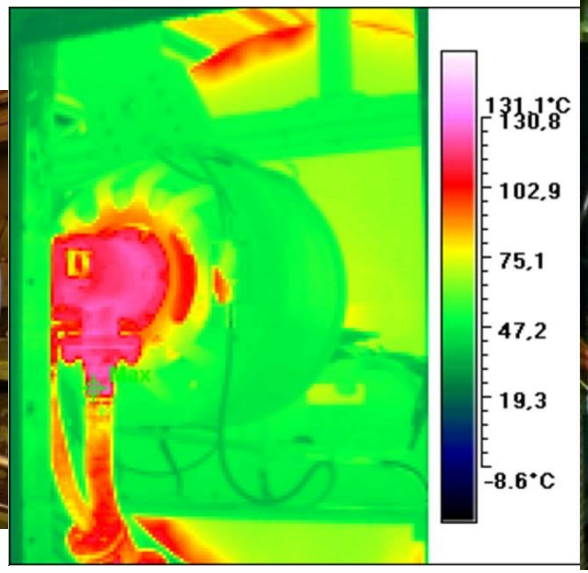
FlexoDirect® is calculated, encapsulated and wounded for reaching the temperature class H (IEC-34-1) = 180°C high dynamic servo drive

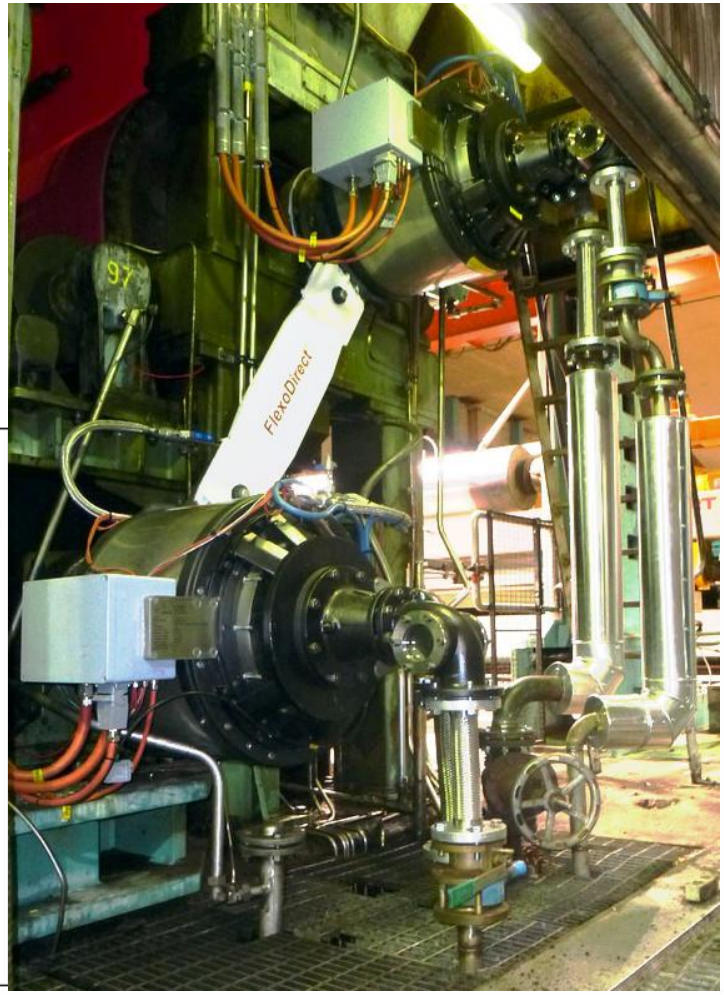
IEC = International Electro technical Commission are indicating the high permissible sustained temperature

thermal class B = 125°C - Standard Asynchronmotor

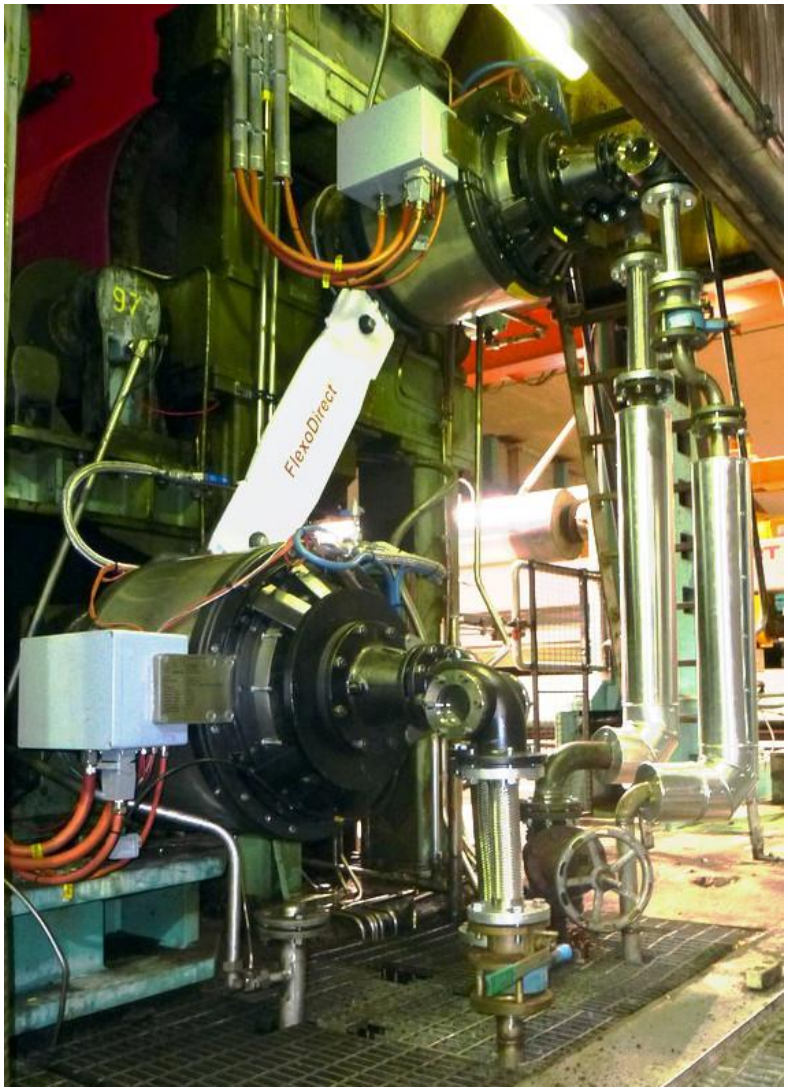
thermal class F = 155°C - inverter-driven standard motor

thermal class H = 180°C - high dynamic servo drives



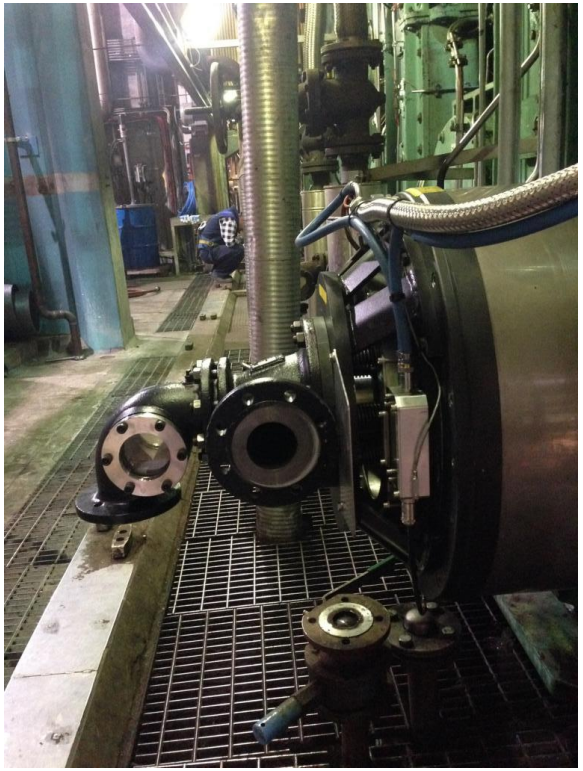


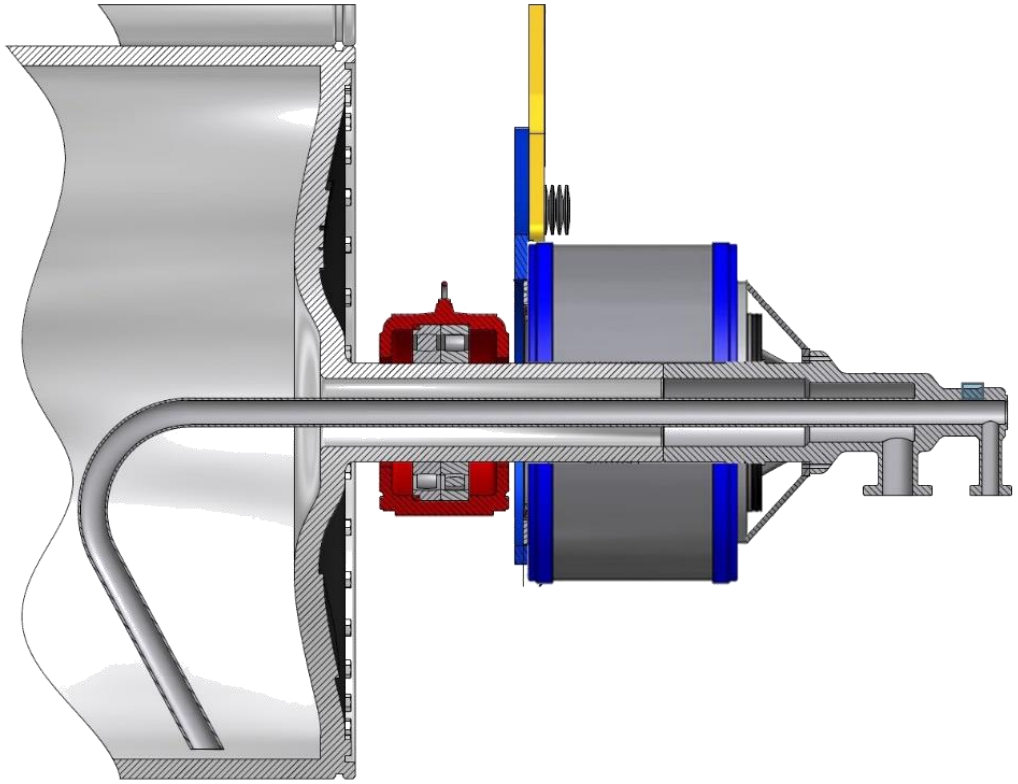
- The torque support ensures the compensation of the three dimensional movement
- No connection to the paper machine frame
  Vibrations and tensions which occur will not be transferred
- Deformations are avoided, which can lead to destruction of the torque support
- Less sensitive to cylinder alignment than traditional drives

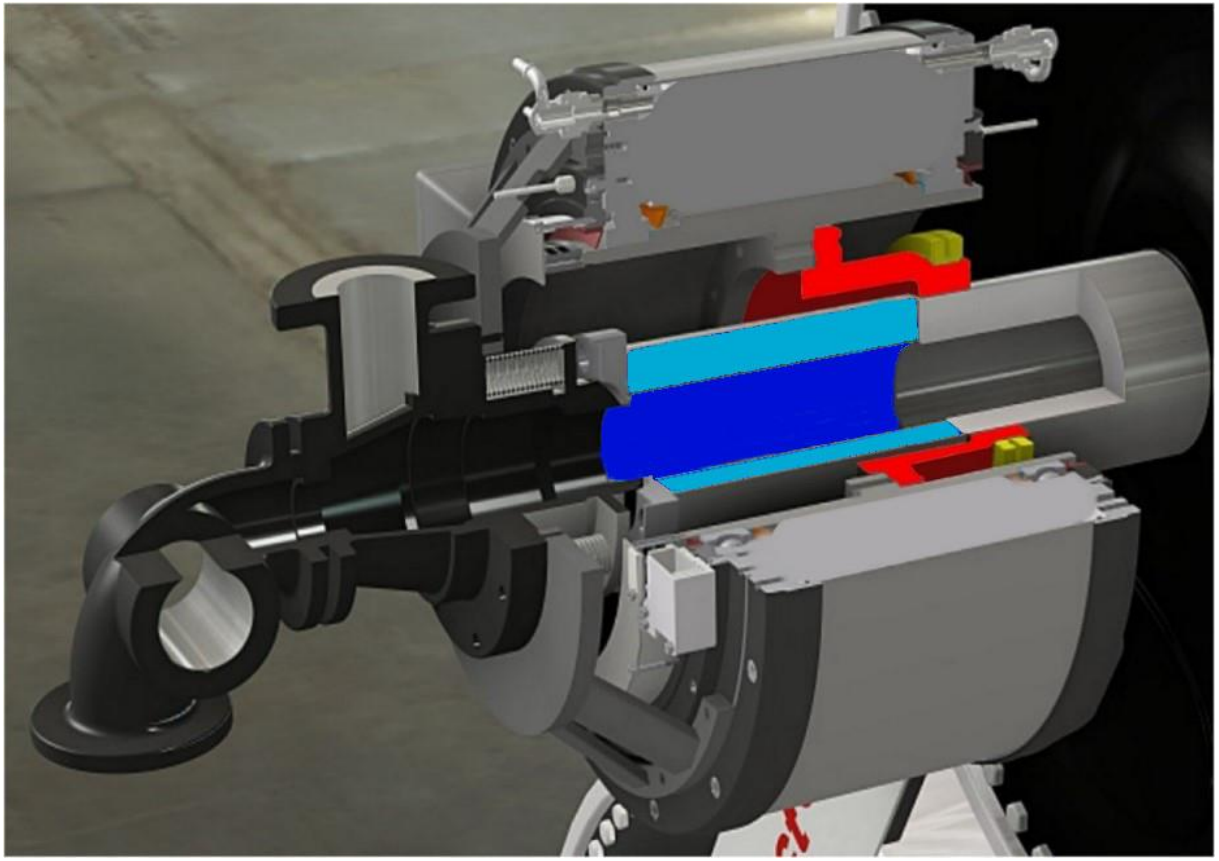


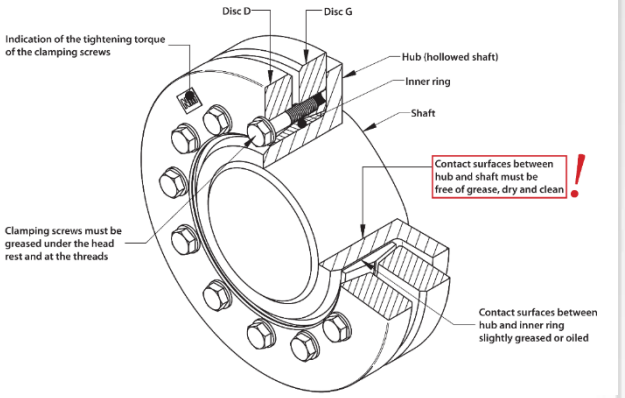
Steam Joint connection

- Mounting of the steam head directly on the motor
- Installation on the tending side as well as on the drive side
- Absorption of the axial and lateral forces from the steam head (up to 22.000 N)
- Thermal decoupling of the cylinder, to avoid heat transmission to the FlexoDirect®









- Extension for the dryer shaft
- Using shrink disc for torque transmission, instead of a feather key

The installation of the FlexoDirect® would lead to following advantages:

- Full torque (nominal) from “0 rpm” to production speed at 100% switch-on-time including all thermal circumtances (no additional derating)
- Cooper windings can operate up to 180°C, high power density
- FlexoDirect® is designed to run with surrounding temperatures up to 135°C; hollow shaft temperatures up to 160°C (steam up to 180°C)
- Advance sealing technology to run in heavy duty areas with dust and high humidity
- Isolated bearings in special high temperature version, calculated lifetime of 10 years (100000 hours) operation
- Highest efficiency in all operating points (94%-97 % at nominal torque) less torque = higher efficiency,
  no field building current – **H**igh **T**emperature **P**ermanent **M**agnet

The installation of the FlexoDirect® would lead to following advantages:

- Highest dynamics without any clearances, gives high accuracy and controllability with high dynamics
- Direct control of speed an torque without any dead time
- Better runability and availability of the machine
- Maintenance reduced to the minimum (less rotating / mechanical parts)
- Water cooled design without any fans – no airflow, no noise, independent from dirt and dust
- The hollow shaft allows the installation of the rotary joints for steam and condensate on the drive-side as well as on the operator-side
- The compact design allows the use inside the drying hood, directly on the drying cylinder shaft.

FlexoDirect®

Reference list

Mondi Dynäs AB, SE 873 81 Väja, Sweden

Data:

26 FlexoDirect®	DA700L 225 / DA700L300
Line speed	V = 1.100 m / min
Working width	AB = 7410 mm
Diameter of the drying cylinders	ø = 1.524 mm
Motor power	80/100 kW
Nominal Ratio Speed	200 Upm
Rated torque	3200 / 4150 Nm

Additional two spare motors of each

In use since: October 2014

The project: Dynäs – PM 6

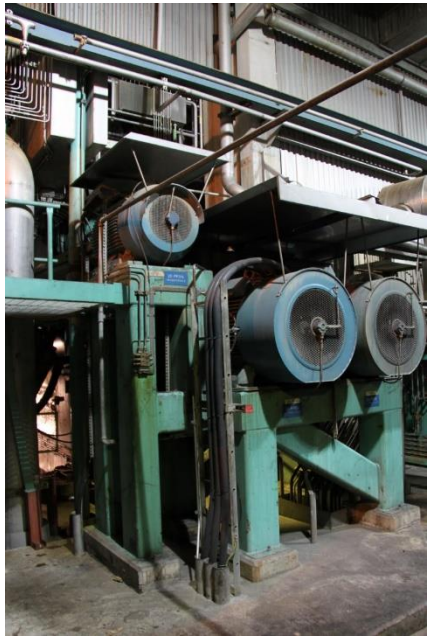
Objectives

- Change of the drive system of the PM 6 (electrical and mechanical drive)
- Original machine builder Beloit Walmsley Fourdrinnier, in the year 1969:
  - Sack Kraft Paper **50 – 160 g/m²**
  - Paper width **6500 mm**
  - Machine speed **775 m/min**

- New drives (electrical and mechanical) should be dimensioned for:
  - Speed (max.) **1100 – 1200 m/min**
  - Speed (min. normal run) **550 m/min**
  - Crawl speed (min.) **15 m/min**

The project: Dynäs – PM 6

Drive situation before the rebuild



FlexoDirect®

Mondi Pine Bluff, Pine Bluff, AR 71612; Arkansas

Data:

2 FlexoDirect®	DA700L 225
Line speed	V = 1000 m / min
Working width	AB = 4699 mm
Diameter of the drying cylinders	ø = 1.500 mm
Motor power	84 kW
Nominal Ratio Speed	250 Upm
Rated torque	3200 Nm

Additional one spare motors of each

In use since: 19. September 2015

FlexoDirect®

Reference list

Mondi Steti, CZ-411 08 Štětí, Czech Republic,

Installation on the tender side
Data:

26 FlexoDirect®	DA700L 225/DA700L 375
Line speed	V = 1000 m / min
Working width	AB =7426 mm
Diameter of the drying cylinders	ø = 1.524 mm
Motor power	84 /147 kW
Nominal Ratio Speed	250 Upm
Rated torque	3200/5600 Nm

Additional two spare motors of each

In use since: 16. October 2015

Why the rebuild of PM5?

- The original mechanical drive parts of the dryer section were from 1975,
  with a design speed below the average operation speed before rebuild in 2015.

- Press section and dry end drive system
  => **were not up to date anymore and required an upgrade.**

- The main target was to replace the drive system in the dryer section, which was
  a closed gear casing on drive side with central direct current motors.

- The electrical part **was sensitive to external power deviations**,
  and **it was difficult to synchronize old and new frequency converters.**

- Furthermore, **significant oil leakage from the gear casing frames caused safety and environmental issues to make matters worse**,

- For **the old drive units, the supplier announced stopping his support from 2016 onwards.**

- Requirements as reduction of operational cost and as well as increase of capacity

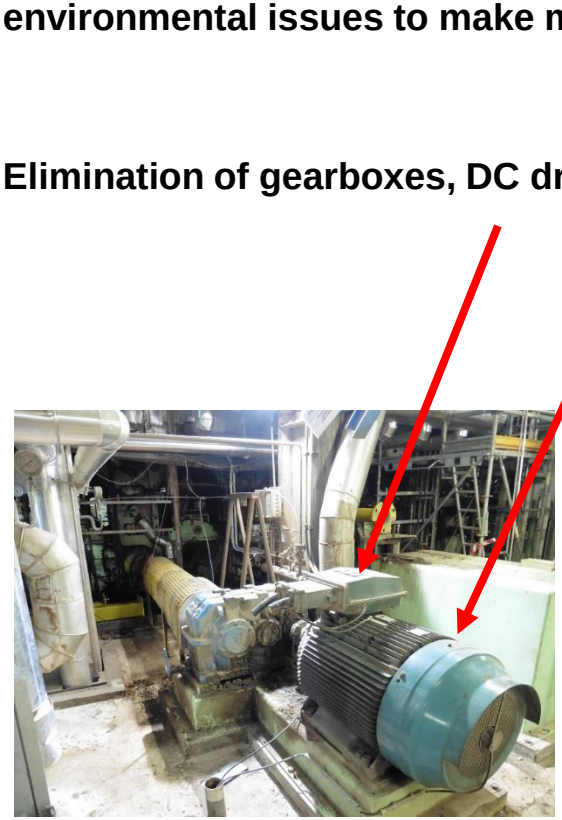
- Significant numbers of web breaks

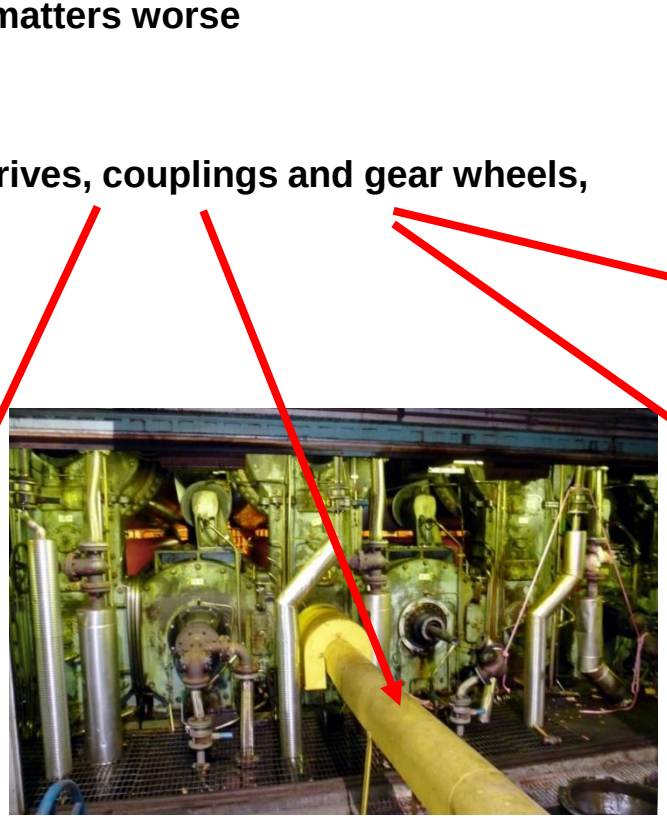
Exist Drive situation closed wheel housing (before the rebuild)

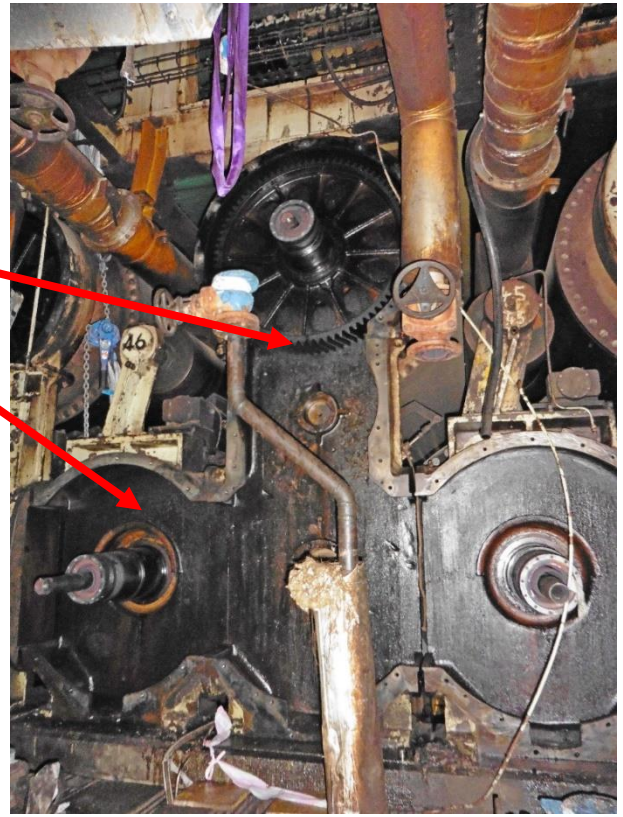
- Closed gear wheel housing on drive side with central direct current motors.
- The electrical part old direct current drives, old frequency converters.
- Significant oil leakage from the gear casing frames

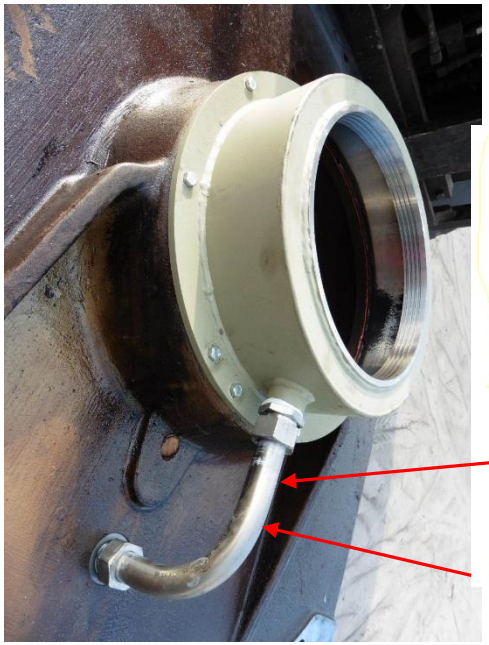
Furthermore, significant oil leakage from the gear casing frames caused safety and environmental issues to make matters worse

Elimination of gearboxes, DC drives, couplings and gear wheels,

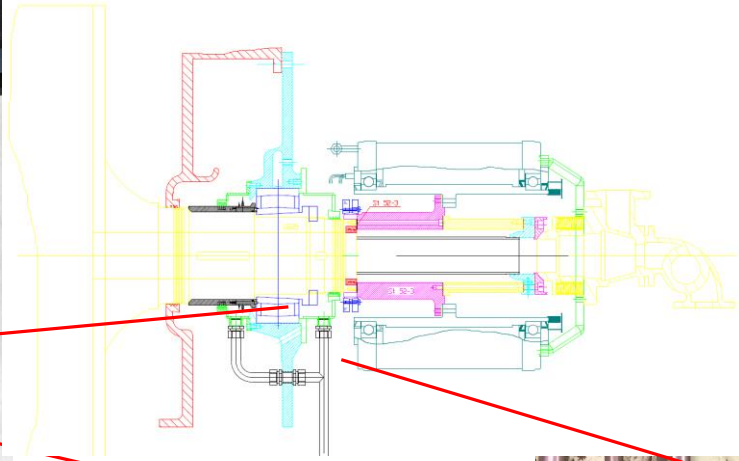


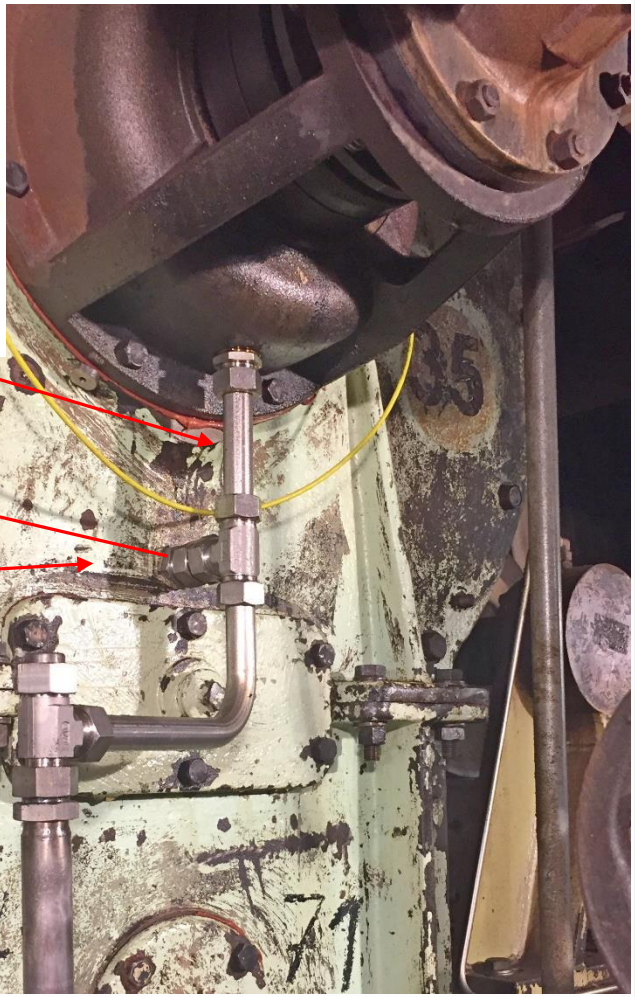


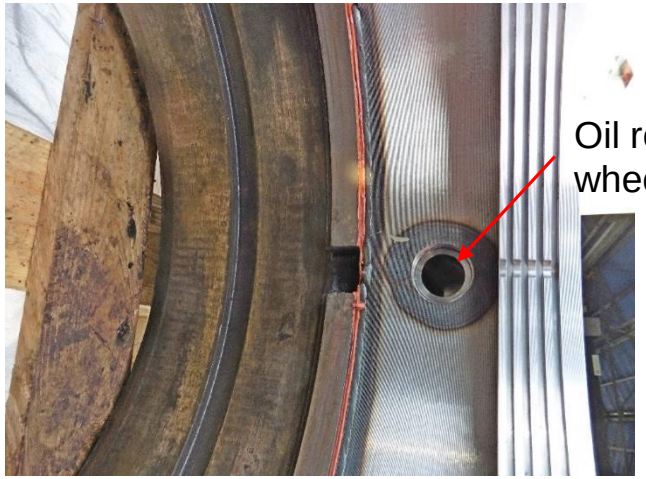




Modification of the Wheel Housing to make sure that no leakage can occur in the wheel housing





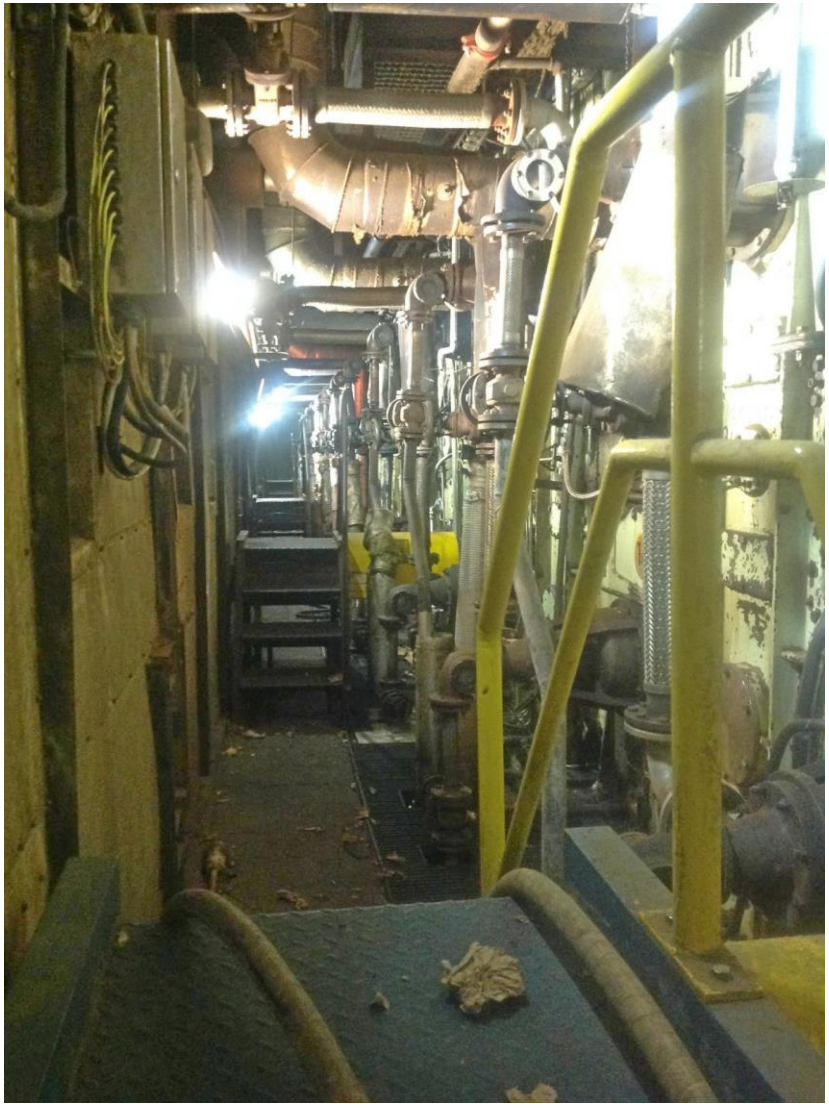


Oil return outside the wheel housing

Before the rebuild

Drive Side - inside the hood

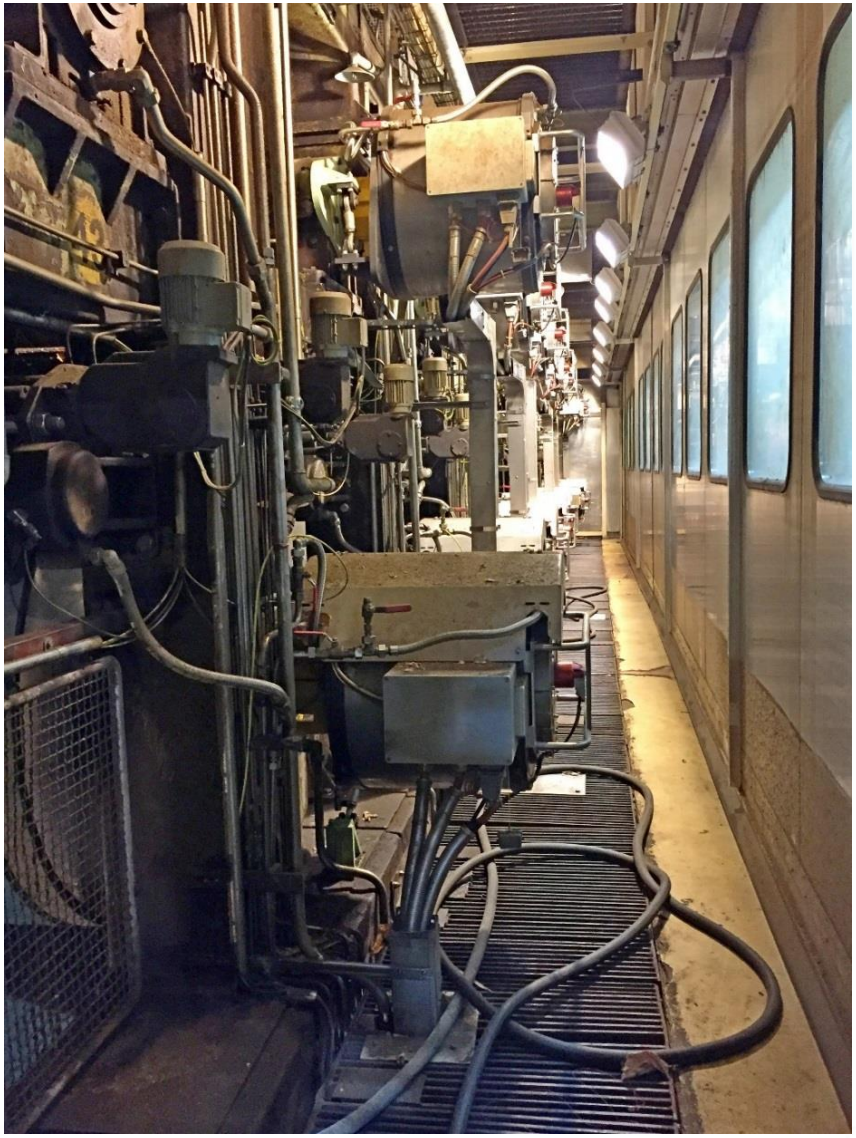
After the rebuild



Mondi Štětí, CZ-411 08 Štětí, Czech Republic

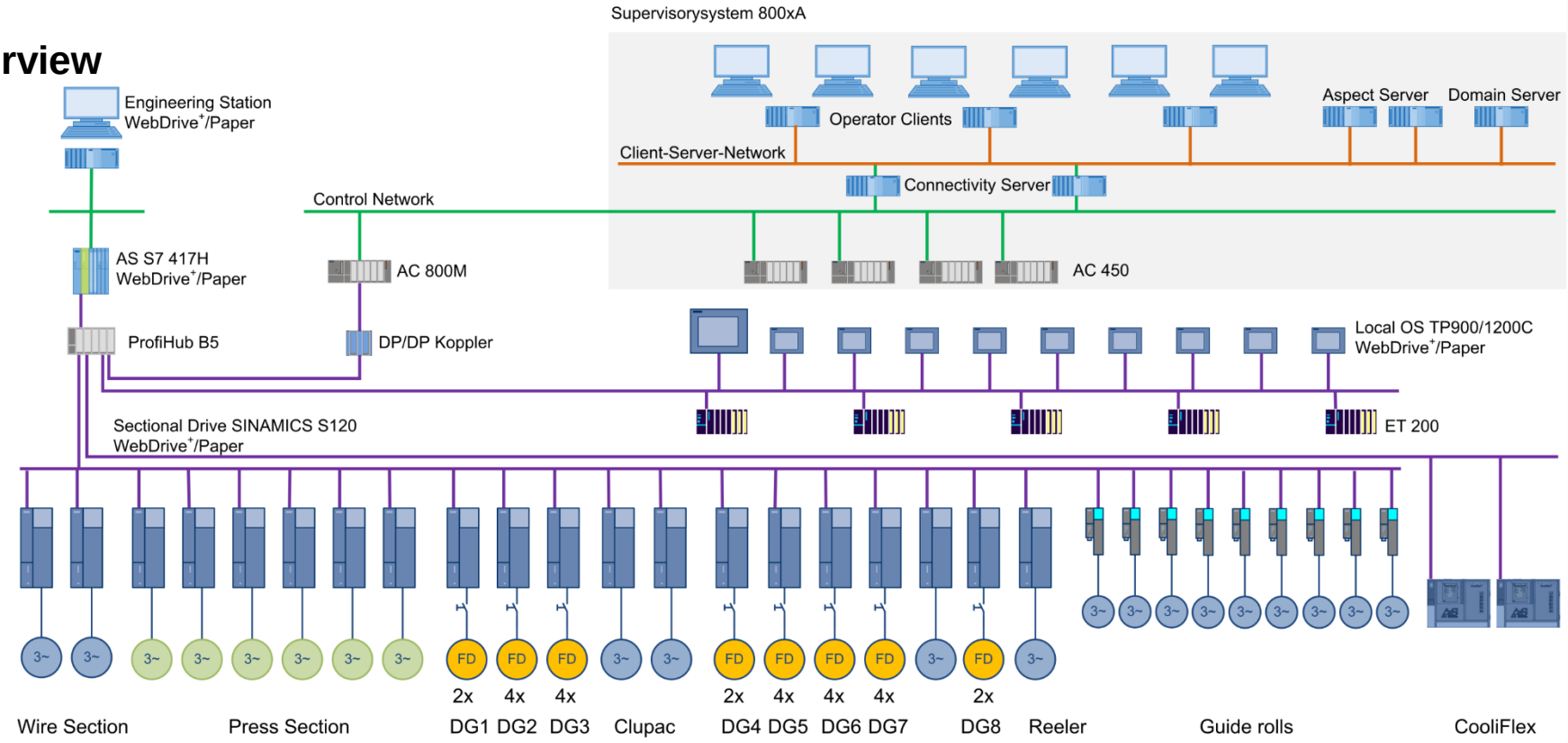
Mondi Štětí PM5 is the first machine to install FlexoDirect® from AS Drives on Tender Side

FlexoDirect®



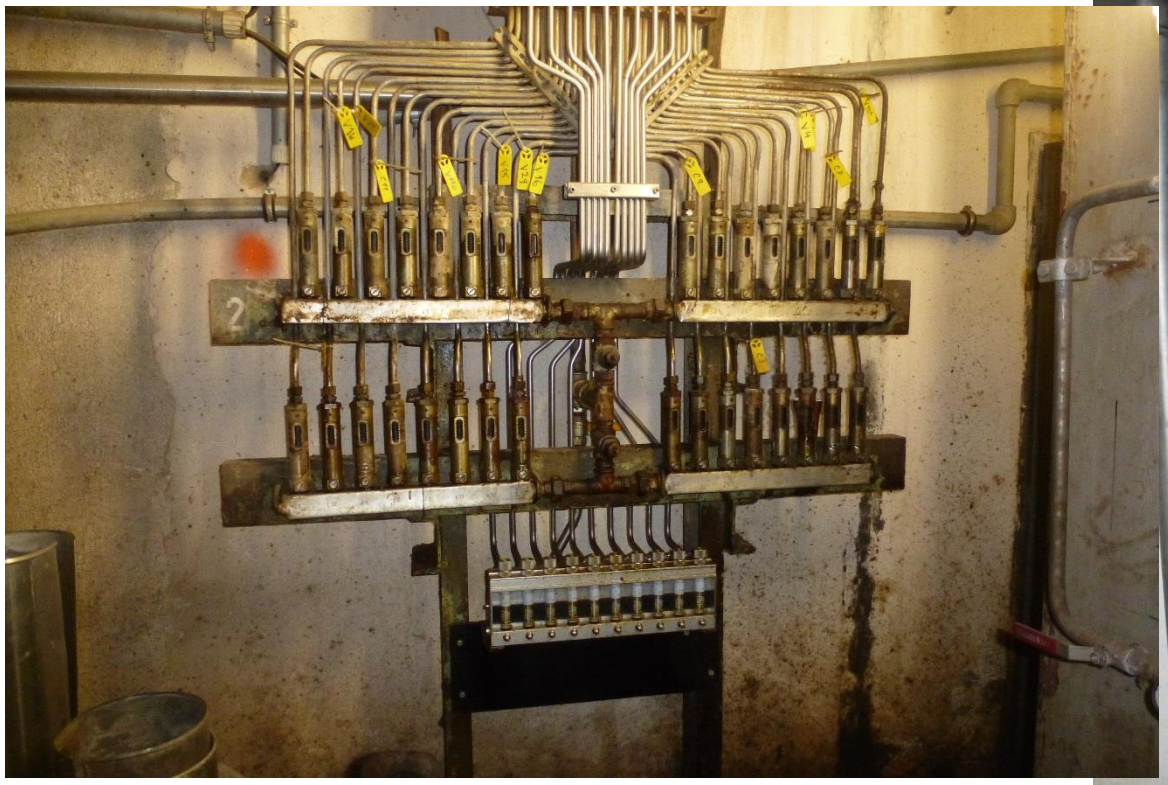
Electrical Part for Sectional Drive PM6

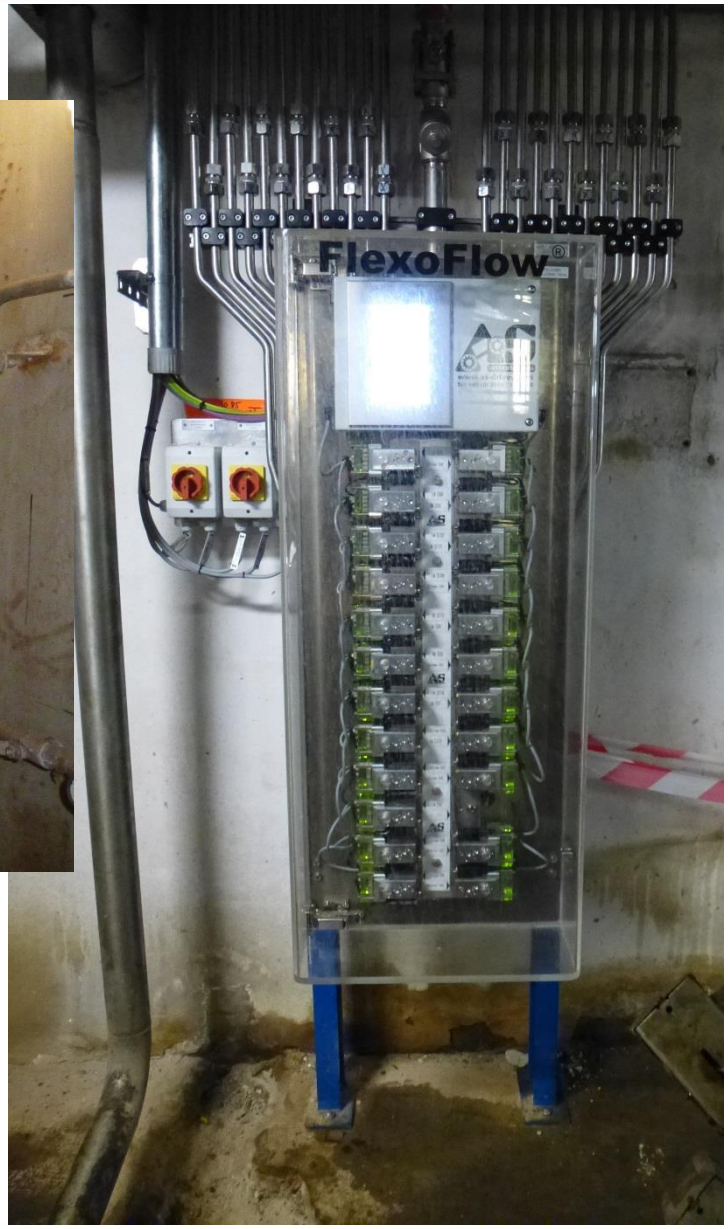
Overview



Lubriflex®

FlexoDirect®





Result of the rebuild Mondi Steti PM5

➢ Total steam consumption	- 14 %
➢ **Total power consumption**	**- 6 %**
➢ Web breaks	- 62 %
➢ **Average speed increase***	**+3 %**
➢ Pressurized air consumption	- 60 %
➢ **Dryer section oil leakage + cleaning cost**	**- 60 %**
➢ **Dryer section time loss reduction mechanical and electrical**	**- 80 %**

Note:
All values refer to the period Januar – December 2016, compared to baseline before rebuild;

* Speed limited by Stock preparation, Head box, After dryer section (drying capacity not enough), winder speed (max.2000 m/min.)

World record 24 hours => 1055 m/min. August 2016

Thank you for your attention

FlexoDrive® – more than just a drive

- From the wet end until the reel
- Speed increase
- Modernization
- Process automation

AS Drives & Services GmbH
Industriestraße 17 Tel.: +49 2864 9008 0
48734 Reken Fax: +49 2864 9008 80