## Sensodec 6S monitoring system

#### **Customized applications for**



#### Integrated in two ways...

#### ... monitoring applications in same system





#### Integrated in two ways... ...monitoring of all machinery in same system



#### Monitoring during the whole machinery/process Life Cycle

#### **Production**



## **Machine Condition Monitoring**

#### **Vibration Measurement Sensors**





## **Machine Condition Monitoring**

#### Examples of faults which can be detected are e.g.







- bearing damages
- unbalance
- misalignment
- resonance
- wear/ looseness
- gear wear /damages









#### **User Interface**

#### Monitoring, Analysis and Follow-up tools





## **Machine Condition Monitoring**





#### System Start-up and Correct Alarm Level Set-up

Ikpinta Virao 0/0 1/0 Ikpohja Pu 0/0 I	Puristin 1 Kr. 0/0 1 KR.:1 KR. 6SY	. 2 Kr. 3 Kr. 4 K 0/0 0/0 1/1 /L2	5 Kr. Välka Päällas 6 Kr. 0/0 0/0 0/0 0/0	Diagnost.	₽ <b>0</b> @×	45				
S 1 KB. Metsä-Botnia										
	Info A Basic monitoring A Mr/s2 PEAK- 6.00- 5.50- 5.00- 4.50- 4.50- 4.50- 3.00- 3.50- 3.00- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 1.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50- 5.50-5.50-		Tracening		28.6.2001 5:09		0 🕘 🗙	Metsä - Botnia Kemi-PK1		
1 Syl vaihde 🌘 📘		Characteristic:	PK1 Kuivatusryhmä 1: 1 Kr. 6: PEAK-HF 0-10 kHz	SYL2: 1 kr. 6SYL2: KP:	Parameter group:	Parameters	C Short menu	MONTH (4WEEKS)		
		Points of display:	Rot.freq.	01 12:33:28	-		Free time setup 03:00 01/01/ 01/01/	1999 - 12:33 11/06/2001		
Curves Curves Bars		5.74 m/s2 0.00 2.3	Speed adaptive alarm limit set-u dynamic alarm lin	p mits	Line Jak		Hz 4.2	Edit curve Class selection Class edition Class edition Delete Save		
		Curve: Created:	11.6.2001 12:33:00	Measured points Alarm limit curve		Cursor 1	Hz m/s2	Timestamp 8.1.2001 18:38:28		
		I rends time:	11.6.2001 12:33:28	Edit class* Edited classes*		Cursor 2     Newest	2.54     0.84       3.65     1.74	8.1.2001 18:38:28 9.1.2001 19:11:14		
© Metso A	Automation Inc.	. 2003						automatior		

#### **Dynamic Behavior During Machine Speed Increase**





#### **Damage Detected with Condition Monitoring System**





## **Lubrication Monitoring**

- Avoiding bearing and gearbox damages with On-line Lubrication monitoring and On-line alarming
- In combination with Condition Monitoring the best tool to detect possible bearing damage after zero flow alarm
- Optimize right flow levels and oil types in combination with On-line temperature monitoring







**metso** automation

## **Lubrication Monitoring**

#### Flow trends for all lubrication points inside one SENSO-160 station





## **Analysing Paper Signals**

Roll cover corrugation causes increase STA vibration trend -STA circular diagram shows 12 peaks / roll revolution





## **Analysing Paper Signals**

Analyzing STA vibration spectrum and Moisture spectrum from Scanner, shows both a max amplitude peak at 52 Hz (=  $12 \times 1000$  roll speed)



STA Moisture spectrum from ScannerRaw Moisture spectrum fromSTA to Sizer top rollScanner



#### **STA-measurement = Synchronous Time Average**





#### Dynamic behavior during machine speed increase





## **Real Time Analyzer**





## **Simultaneous Multi Channel Analysis**

₩ MULTI-CHANNEL ANALYSIS										
	9 8 8 ×			SENSODEC 6S						
Analysisname: PRESS TEST 12.1.1999 Status: Active	STA view By triggers T Input	Yrigger: <u>CENTER ROLL</u> t signal:	Bars     Peak     C RMS 48     C RMS 14	0680 Hz 002000 Hz 1 day						
Speed: 1318 m/min Rotation trequency: 4.512 Hz Last performed : 15.03.99										
CENTER ROLL BLADE BAR BACK 50.0 m/s2 -50.0 0	€	regnesses die beste die besteren auferen andere	€ ¥x 0 0 Hz 10000	1.28 5.0 -38.4 →x +% 100						
CENTER ROLL BLADE BAR FRONT 50.0 m/s2 -50.0 0	€	ramon dale dalen dale non-steranon	€ ↓ ↓ × 0 Hz 10000	1.28 ♥ ➡ 5.0 -38.4 ♥ ➡ e <sup>-%</sup> 100						
CENTER ROLL BACK 50.0 m/s2 -50.0 0	€ ↓ 5.0 m/s2 0.0 0 0	ra,	€ ¥ 0 0 Hz 10000							
CENTER ROLL FRONT 50.0 m/s2 -50.0 0	€ ↓ 5.0 m/s2 0.0 0.0	en an dek deka dek ana skenna	€ ↓× 0 Hz 10000	1.28 () (↓ × )						



## **System Technical Data**





## Why invest in a Monitoring System

#### **Condition Monitoring**

- Reducing unscheduled shut downs and increase the paper machines availability and production
- Tool to plan and schedule shut downs
- Avoid severe machine crashes and costly time consuming repairs
- Protect personnel against human injuries
- Asset management protect your investments
- Runnability & quality monitoring
- Getting information about components performance in the machine
- Detect runnability problems in a early stage
- Detecting components having effect on paper properties and quality
- Monitor instabilities in stock approach system
- On-line monitoring during production instant response of changes



## **Sensodec 6S System Structure**

- Windows 2003 Operation System and User Interface
- Working Stations Windows ≥ 2000/XP/2003
- SQL database Oracle ver. 9
- Standard TCP/IP-network (100Mb/s)
- Data protection Raid 5





## **Sensodec 6S System Structure**

- Independent Measuremet and Analyzing Substation
- Simultaneous Multi Channel Analyzing (SMCA)
- 10 measurement modules / substation
- 8 channels/module => 80 channels/substation
- Each channel has a 18-bit AD-converter, power supply and galvanic (optical) separation
- 32 bit DSP module (Digital Signal Processing)





#### Field Mountable Analysis Substation with 80 I/O positions

- Includes one analysis substation
- Dimensions 1200 \* 600 \* 300 mm
- Cabinet material acid-proof steel
- Cabinet is closed, equipped with internal fan
- Shielding class IP 65
- Power required 0.2 kW / field unit, single-phase 110/230 VAC, 60/50 Hz





#### Field Mountable Analysis Substation with 40 I/O positions

- Includes one analysis substation
- Dimensions 380 \* 600 \* 350 mm
- Cabinet material painted steel
- Cabinet is equipped with door
- Shielding class IP 65



Power required 0.2 kW / field unit, single-pnase 110/230
 VAC, 60/50 Hz



### **System Self Diagnostic**

Processes         Wire pr1         Wire pr2         Bleach 1/0         Fans 0/0         SC21         SC22         Winder 0/0           Short c.         Wire         Press         Dryer 1         Dryer 2         Dryer 3         Dryer 4         Dryer 5	Diagnost.         USER I I I I I I I I I I I I I I I I I I I				
0/0 0/1 2/1 0/0 0/0 0/0 0/0 0/0	0/0 0/0 0/0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				
	USER X B O S X UPM-Kymmene Oy KAJAANI-PM2				
BT880         BT800         BT800         BT800 <th< td=""><td>IP-address:         141.172.68.17         Timestamp:         18.11.2002         6:33:06           Analysis unit:         BT880104P         Temperature:         37.0         C</td></th<>	IP-address:         141.172.68.17         Timestamp:         18.11.2002         6:33:06           Analysis unit:         BT880104P         Temperature:         37.0         C				
201P 202P 203P 301P 401P 501P 601P	P 1 2 3 4 5 6 7 8 9 10				
BT880 701P 801P 901P					
DIAGNOST:BT880104P:SLOT 3:CHANNEL 2					
Ghannel info Position: BH497501E R4 viiranjohtotela 062 : HP					
Sensor: CD Sensor: RVT-1205					
Wind Media F Bias out of range.	P       A       A       A       A       A       A       B         Image: CK       Image: CK<				
	29.4.2004 9:34				



### Sensodec sensors and where to use them

Vibration sensors



RVT-105

- wire section
- press section
- size press
- coaters
- calender
- nip analysis



#### **RVT-120S**

- dryer groups
- paper lead rolls
- gears and motors

**Triggering sensors** 



**RTS-226** - Magnetic triggering sensors for rotating elements



RTS-211 - optical sensor for press felt

**RTS-224** 



Pressure sensors



**RPT-122** - stock approach - size press, coaters: rod/blade loading pressure





#### **Sensors developed for Paper Machine Environment**



# Sensor for dryer section type RVT-120S installed in radial direction





# Sensor for dryer section type RVT-120S installed on mechanical drive in radial direction





#### Roll trigger for measuring of roll frequency and for calculation of defect frequencies





#### Roll trigger for measuring of roll frequency and for calculation of damage frequencies





### **Remote Diagnostics Center**



