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Integrating the PI System with SAP

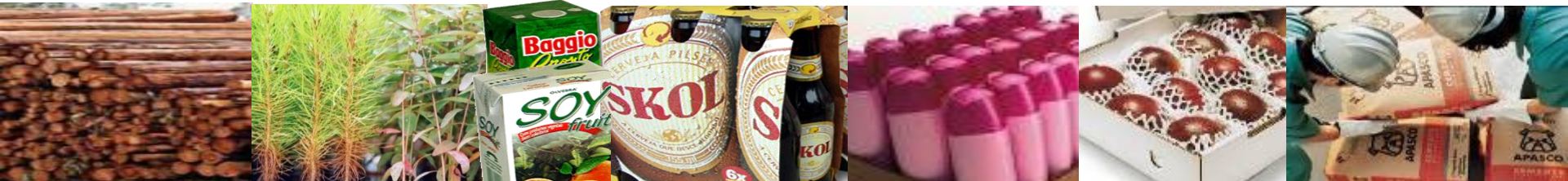
Presented by

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Klabin: A Leader Company

- ✓ 111 years of tradition
- ✓ 10,504 employees
- ✓ Largest producer, exporter and recycler of paper in Brazil
- ✓ Exports 62% of its production to over 60 countries
- ✓ Leading producer of packing paper and board, corrugated boxes and industrial sacks
- ✓ Single manufacturer of boards for liquid packings in Latin America
- ✓ In 2010 Klabin was elected the best pulp and paper company in Brazil



Klabin – Company Locations



- Florestal**
Forestry
- Alto Paranapanema (SP)
- Planalto Catarinense (SC)
- Campos Gerais (PR)
- Planalto de Guarapuava (PR)

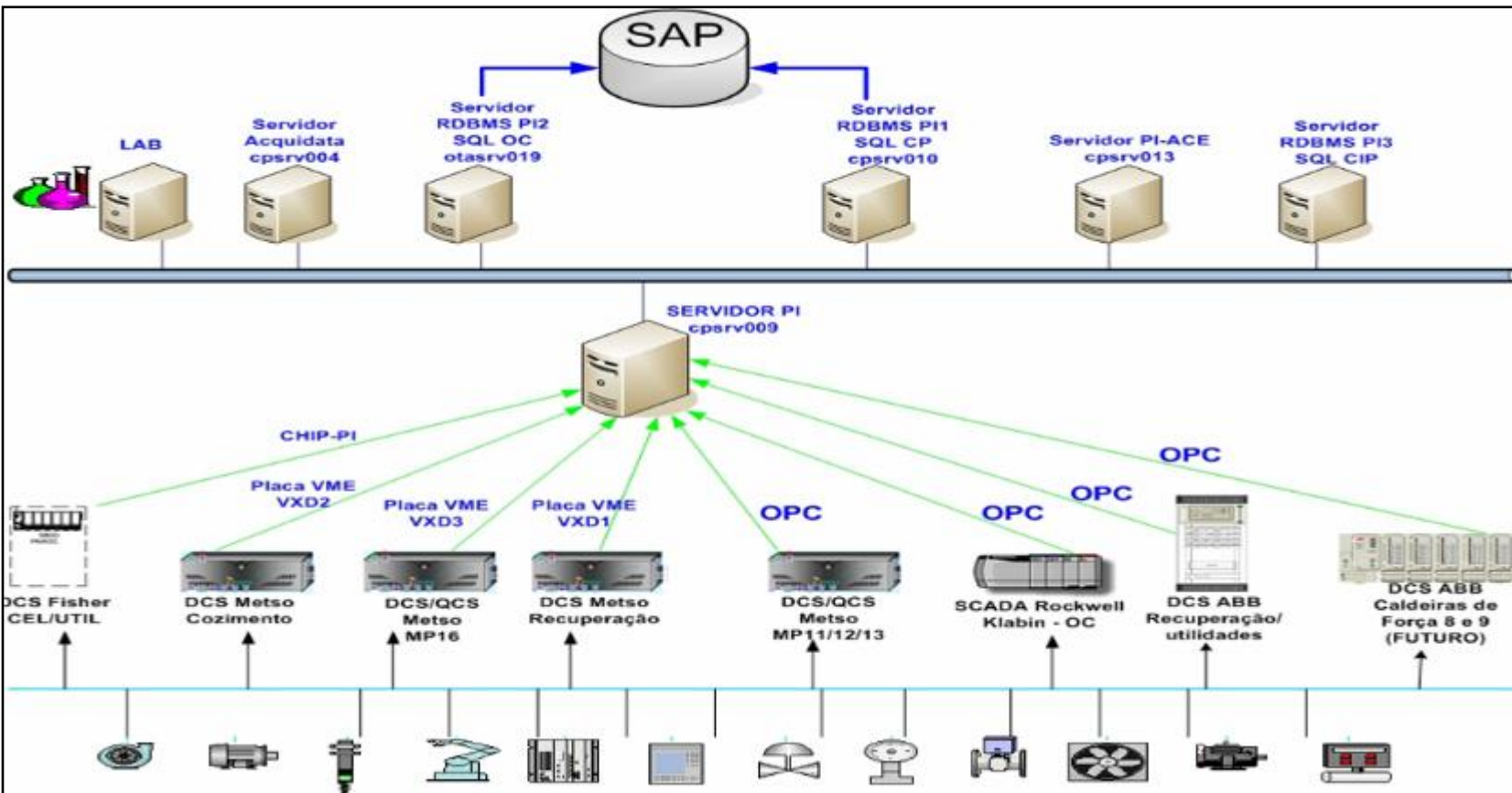
- Papéis para Embalagens**
Packaging Paper
- Angatuba (SP)
- Correia Pinto (SC)
- Otaçílio Costa (SC)
- Telêmaco Borba (PR)

- Sacos Industriais**
Industrial Sacks
- Goiana (PE)
- Lages (SC)
- Pilar (Argentina)

- Embalagens de Papelão Ondulado**
Corrugated Packaging
- Goiana (PE)
- Feira de Santana (BA)
- Betim (MG)
- Del Castilho (RJ)
- Jundiá (SP)
- Piracicaba (SP)
- Itajaí (SC)
- São Leopoldo (RS)
- Mossoró (RN)

- Papéis Recicladados**
Recycled Papers
- Goiana (PE)
- Guapimirim (RJ)
- Ponte Nova (MG)
- Piracicaba (SP)

PI System Architecture in Santa Catarina Plants



Optimization Projects at Klabin SC

In 2005, Klabin began to use PI System to derive better operational performance through Process Optimization in various areas of the mill. Below are some samples of projects done for process improvements and ROI obtained with the PI System:

- ✓ **2005** – Recovery Boilers and Evaporators optimization linking PI System to Metso
- ✓ **2008** – Paper Test Labs– Acquadata and PI System integration to SAP QM via MII
- ✓ **2009** – Installed Metso AQC #16 Paper Machine
- ✓ **2010** – Implemented Br@incube on #13 Paper Machine
- ✓ **2010** – Began the implementation of the link between the PI System and SAP PM for condition-based maintenance

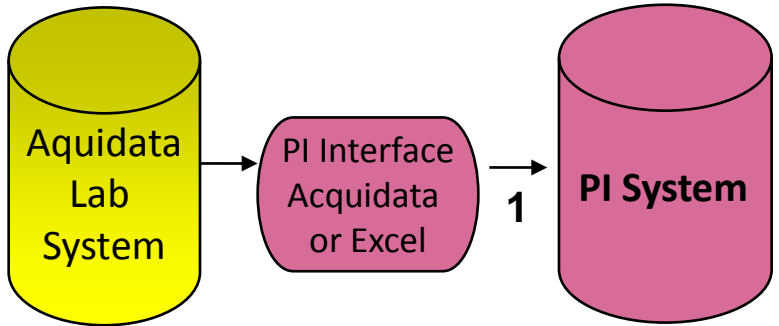


Linking Paper Machine Data from PI System to SAP QM

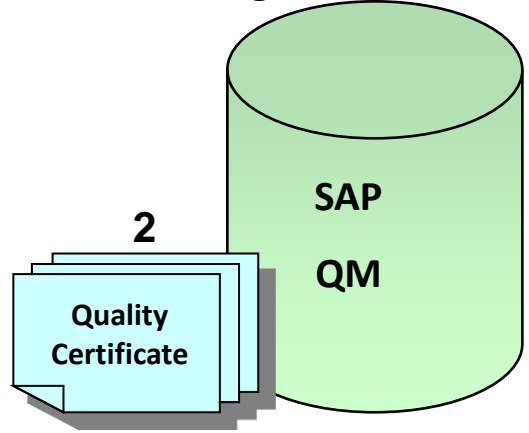
Previous Situation before PI System Integration to SAP QM

Objective: Needed an efficient way to integrate the PI System and SAP QM by sending quality data about the Jumbo roll (physical tests) from PI System to SAP QM, avoiding manual data entry of Lab data.

Test data was sent to the PI System via: Acquidata/Autoline/Excel interface



Jumbo roll lab tests were then **entered manually** into SAP-QM where COA's are generated



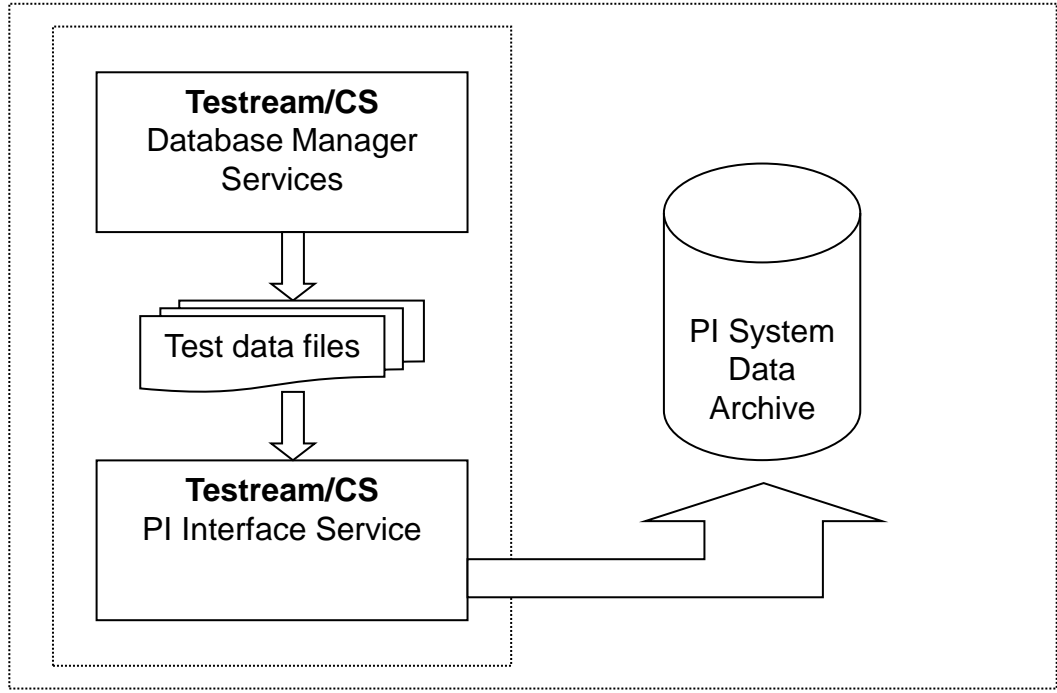
AcquiData – Quality System for Paper Lab

- ✓ Automatic acquisition of the lab tests directly from the testing equipment
- ✓ Ability to Import the Paper Roll numbers from PI System
- ✓ Ability to Export the test results by roll back to PI System
- ✓ Validation of the results by product specification / limits
- ✓ Statistical calculations
- ✓ Track/Calibrate lab instrumentation
- ✓ Manage Lab Data specification targets and limits

Integration AcquiData – PI System

Lab results via AcquiData

- Air Permeation
- Bursting strength
- Tensile strength
- Thickness
- Roughness
- Tearing
- ...
- ...



Solution Architecture

This is how it looks in Excel with PI System Data

After collecting the data, the values are sent to PI System.

The tests are stored so that if the users enters production plan: RCO_MP16_Rev02, the accompanying tests by Jumbo and position can be displayed.

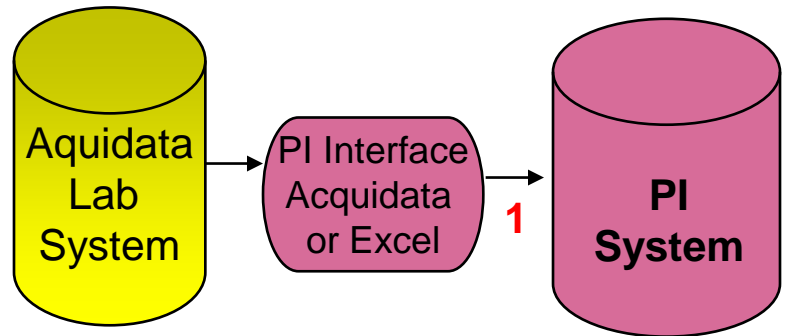
The screenshot shows an Excel spreadsheet with the following data tables:

Jumbo Rolo		169L0323
Produto	SAK16085	
Hora Início	3/11/2009 14:03	
Hora Final	3/11/2009 14:37	
Peso Jumbo Rolo	9,994t	
Gram - Esp_Máx	88,0 g/m ²	
Gram - Esp_Obj	85,0 g/m ²	
Gram - Esp_Mín	83,0 g/m ²	
Gram Méd Sensor	86,3 g/m ²	
Gram Virada J.Rolo	87,03 g/m ²	
CD GSM	1,52 g/m ²	
CD GRM	0,93 g/m ²	
MD GSM	1,17 g/m ²	
MD GRM	1,74 g/m ²	
Umid - Esp_Máx	9,00%	
Umid - Esp_Obj	7,50%	
Umid - Esp_Mín	6,00%	
Um Méd Sensor	8,06%	
Umid Virada J.Rolo	7,98%	
CD UMM	1,62%	
MD UMM	0,75%	

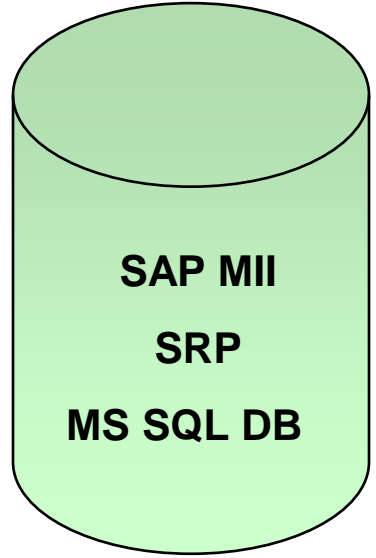
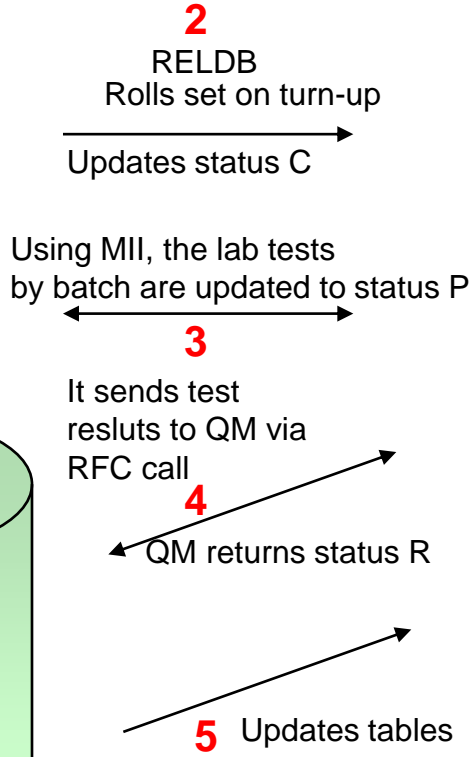
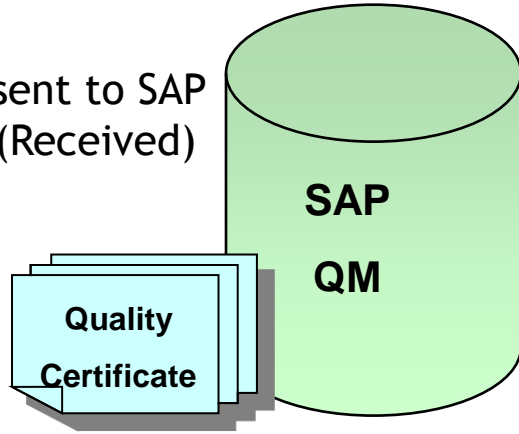
	FO	Traq_L	Traq_T	Along_L	Along_T	TEA_L	TEA_T	TEA Bal	Rasg_L	Rasg_T	Arreb	Res_Ar	Cobb T	Cobb F	COF
J_Rolo	1,50	5,7	3,8	8,5	8,1	273	217	469	1.243	1.500	450	12,6	30,4	-	-
Pos_1	1,00	3,4	3,3	10,6	9,4	255	220	462	1.251	1.616	371	14,8	-	-	-
Pos_2	1,50	5,6	3,8	7,9	9,6	256	252	507	1.228	1.670	437	13,4	-	-	-
Pos_3	1,30	5,8	4,5	8,0	9,8	267	296	574	1.205	1.724	551	14,0	-	-	-
Pos_4	1,80	6,7	3,8	8,2	7,4	303	189	463	1.212	1.563	378	12,3	-	-	-
Pos_5	1,40	5,4	3,9	8,1	7,0	250	193	421	1.219	1.402	480	12,3	-	-	-
Pos_6	1,50	6,1	4,0	8,4	6,5	283	181	427	1.198	1.509	524	11,4	-	-	-
Pos_7	1,40	5,7	4,2	8,9	7,0	279	200	450	1.180	1.440	456	11,2	-	-	-
Pos_8	1,60	6,5	4,1	9,0	8,2	310	230	510	1.161	1.370	466	11,3	-	-	-
Pos_9	1,70	6,2	3,6	8,4	7,7	284	196	447	1.233	1.375	507	11,5	-	-	-
Pos_10	1,80	5,7	3,2	7,2	8,6	245	203	432	1.424	1.380	330	13,5	-	-	-

Legenda:	Especificação	Valores Determinantes	Valor Determinante, porém direcionado Folha Interna
	Resultado	Dentro Especificação	Abaixo Especificação

Situation after integrating PI System to SAP QM



Status:
 C-Created
 P- available to be sent to SAP
 R- updated in SAP (Received)

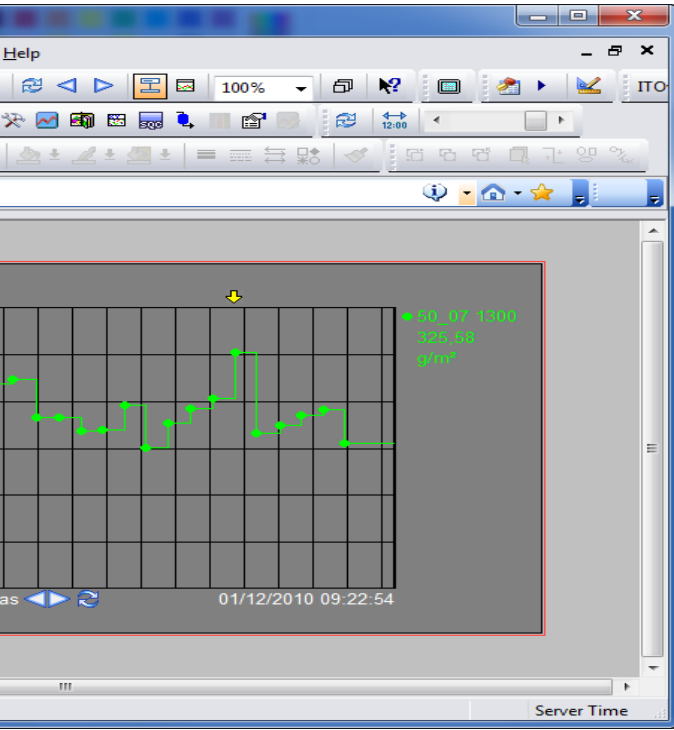


Data Flow

1. Laboratory informs the finish of all quality tests of a roll and updates a PI Tag
2. This tag triggers a RelDB interface that posts the roll data in a table of the SAP MII SQL Server database;
3. A MII job recovers the test results data from PI System and store the results at another table called RESULTADO. The same jobs updates a flag on this table indicating that the data is ready to be sent to SAP QM
4. Another scheduled job reads all the data on this table and sends to SAP through a RFC call. The status of the records are updated to "R" = Received by SAP
5. In the other way, a third MII job downloads SAP master data to update in the MII database tables used for the mapping between the SAP objects and PI System objects.
6. The user decision is done by the Laboratory operator by analyzing the Lab data.

Jumbo Roll Data in PI System

The screenshot shows the 'Batch Database - PI System Management Tools' application. On the left, there are two tree views: 'Collectives and Servers' and 'System Management'. The 'Collectives and Servers' tree shows a hierarchy starting with 'masrv011', which contains 'BSS Support' and 'Modules'. The 'Modules' folder is expanded to show 'ENR1', 'ENR7', 'MP7', 'CV_Retroativo', 'ENR6', and 'ENR9'. The 'System Management' tree shows 'Alarms', 'Batch', 'Data', 'Interfaces', 'IT Points', 'Operation', 'Points', and 'Security'. The 'Batch' folder is expanded to show 'Batch Custom Names', 'Batch Database', and 'Batch Generator'. The 'Batch Database' folder is further expanded to show a list of 'PIUnitBatches (ENR7) (38)'. One batch, 'ENR702720101130 (31315)', is selected and highlighted in blue. The main pane on the right displays the details for this selected batch, titled 'PIUnitBatch (BSS Batch)'. The details include: Batch ID: ENR702720101130, Product: 31315, PIUnit: ENR7, Start Time: 30/11/2010 17:33:22, End Time: 30/11/2010 18:15:30, Server: masrv011, and Unique ID: 08100000-F54C-8251-0000-100800000000.



- PI BatchView
- PI ProcessBook

Jumbo Roll Production data in SAP MII

SISTEMA DE REGISTRO DE PRODUÇÃO

07 - MAQ PAPEL 07 (PR) [P] Resultados Estação Desconhecida

Daniel Takara [SAPQUARESULTADO] [PRD]

Filtros

Produto PI: _____ Máquina: 07 PROCURAR

Produto SAP: _____ Lote: 0710L3027

Tag: _____ Teste SAP: _____

Máquina	Data	Rolo	Tag	Produto PI	Produto SAP	Valor	Teste SAP	Lote SAP
07	30/11/2010 17:33:22	27	50_07 1300	31315	KKC07315	317,50	PPTF_GRAMATURA	0710L3027
07	30/11/2010 17:33:22	27	50_07 1900	31315	KKC07315	8,49	PPTF_SCT_L	0710L3027
07	30/11/2010 17:33:22	27	50_07 1901	31315	KKC07315	6,32	PPTF_SCT_T	0710L3027
07	30/11/2010 17:33:22	27	50_07 201	31315	KKC07315	76,22	PPTF_ASPEPEZA_C	0710L3027
07	30/11/2010 17:33:22	27	50_07 205	31315	KKC07315	538,83	PPTF_RIGIDEZ_L	0710L3027
07	30/11/2010 17:33:22	27	50_07 206	31315	KKC07315	261,33	PPTF_RIGIDEZ_T	0710L3027
07	30/11/2010 17:33:22	27	50_07 208	31315	KKC07315	374,92	PPTF_RIGIDEZ_G	0710L3027
07	30/11/2010 17:33:22	27	50_07 300	31315	KKC07315	1,39	PPTF_PPS_C	0710L3027
07	30/11/2010 17:33:22	27	50_07 400	31315	KKC07315	455,75	PPTF_ESPESSURA	0710L3027
07	30/11/2010 17:33:22	27	50_07_A_Cielab_C	31315	KKC07315	-0,12	PPTF_A_CIELAB	0710L3027
07	30/11/2010 17:33:22	27	50_07_B_Cielab_C	31315	KKC07315	2,19	PPTF_B_CIELAB	0710L3027
07	30/11/2010 17:33:22	27	50_07_Ew_Latico	31315	KKC07315	0,39	PPTF_ACIDO_LATICO	0710L3027
07	30/11/2010 17:33:22	27	50_07_Ew_Peroxido	31315	KKC07315	0,55	PPTF_PEROXIDO	0710L3027
07	30/11/2010 17:33:22	27	50_07_L_Cielab_C	31315	KKC07315	93,58	PPTF_L_CIELAB	0710L3027
07	30/11/2010 17:33:22	27	50_07_Mottling	31315	KKC07315	0,79	PPTF_MOTTTLING	0710L3027
07	30/11/2010 17:33:22	27	50_07_ZDT	31315	KKC07315	257,67	PPTF_ZDT	0710L3027
07	30/11/2010 17:33:22	27	7UMID_AC	31315	KKC07315	7,42	PPTF_UMIDADE	0710L3027

Imprimir Exportar para Excel [F12] - Menu

- Monitoring screen in SAP MII showing the mapping between the PI System Product Code and the SAP Product Code with the Test Results for each batch (Jumbo Roll)

SAP QM – Test results

The transaction, QE51, was used to validate the tests received in QM from MII/PI System so that a Certificate of Analysis can be created for the customer.

Lista de trabalho: entrada de resultados

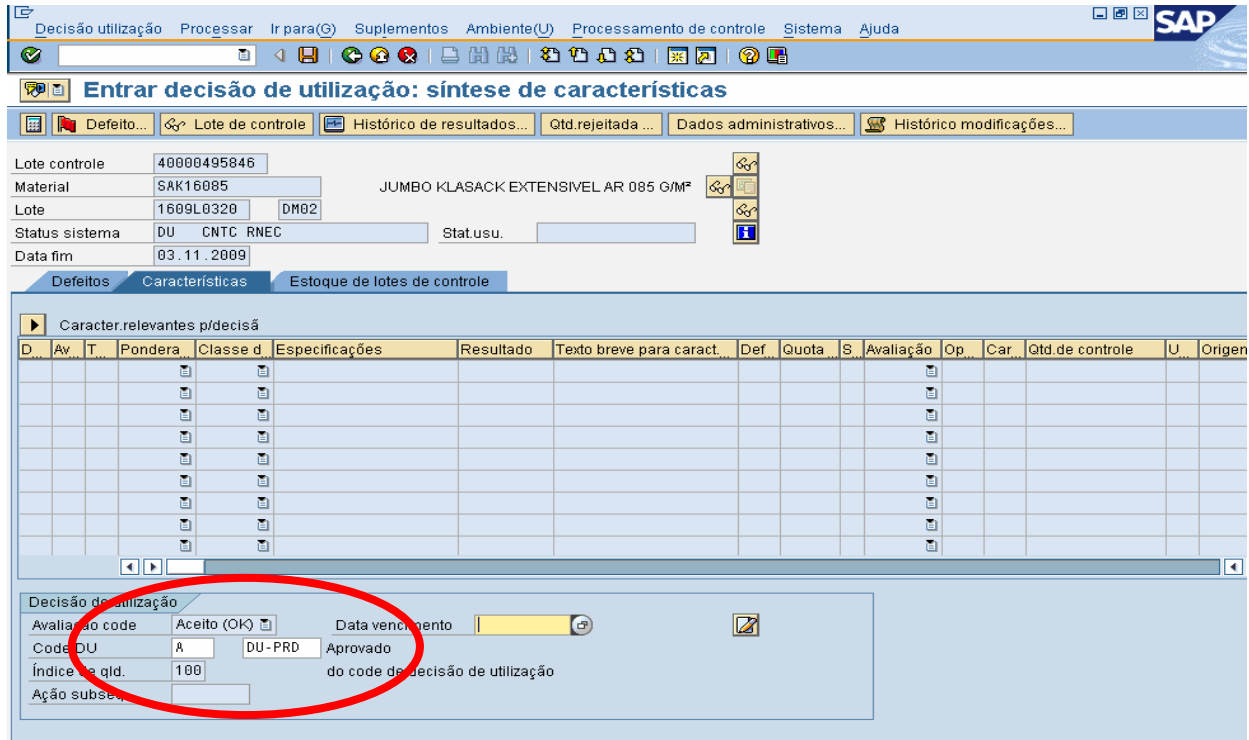
Entrar resultados: síntese características

Material: 58118895 JUMBO KLAGACK EXTENSIV Lote: 1609L0326
Lote cot.: 400049554
Operação: 0018 MP18 - JUMBO SAC 05 08Q Car.: CPFI
Ordem: 0040012993

Id	Q	Título deve ser cor	Especificação	A. controla	Controla	Resultado	Valor original	Classe	Módulo	Operação controle	T	D
			Quantidade	03,0 - 00,0 g/m2	1	1	86,18	85,0				
			Umidade	0,0 - 9,8 %	1	1	7,58	7,5				
			Encapulação-MD	1,2 - 8,9 %	1	1	7,58	7,5				
			TGA - MD	220,0 - 260,0 Jim2	1	1	256,18	258				
			TGA - CD	160,0 - 224,0 Jim2	1	1	160,18	162				
			Resíduo seco - MD	1002 - 1418 mN	1	1	1212,6	1212				
			Resíduo seco - CD	1222 - 1647 mN	1	1	1356,8	1358				
			COE (B) sel - Base/29	34 g-010 m2	1	1	20,8	20				

SAP QM – Usage Decision

Also, Usage Decision is made by the operator on this screen.



The screenshot shows the SAP QM Usage Decision screen. The title bar reads "Decisão utilização" and the main title is "Entrar decisão de utilização: síntese de características". The screen displays various data fields and a table of relevant characteristics.

Data Fields:

- Lote controle: 40000495846
- Material: SAK16085 (JUMBO KLASACK EXTENSIVEL AR 085 G/M²)
- Lote: 1609L0320 (DM02)
- Status sistema: DU CNTC RNEC
- Data fim: 03.11.2009

Table: Caracter. relevantes p/decisã

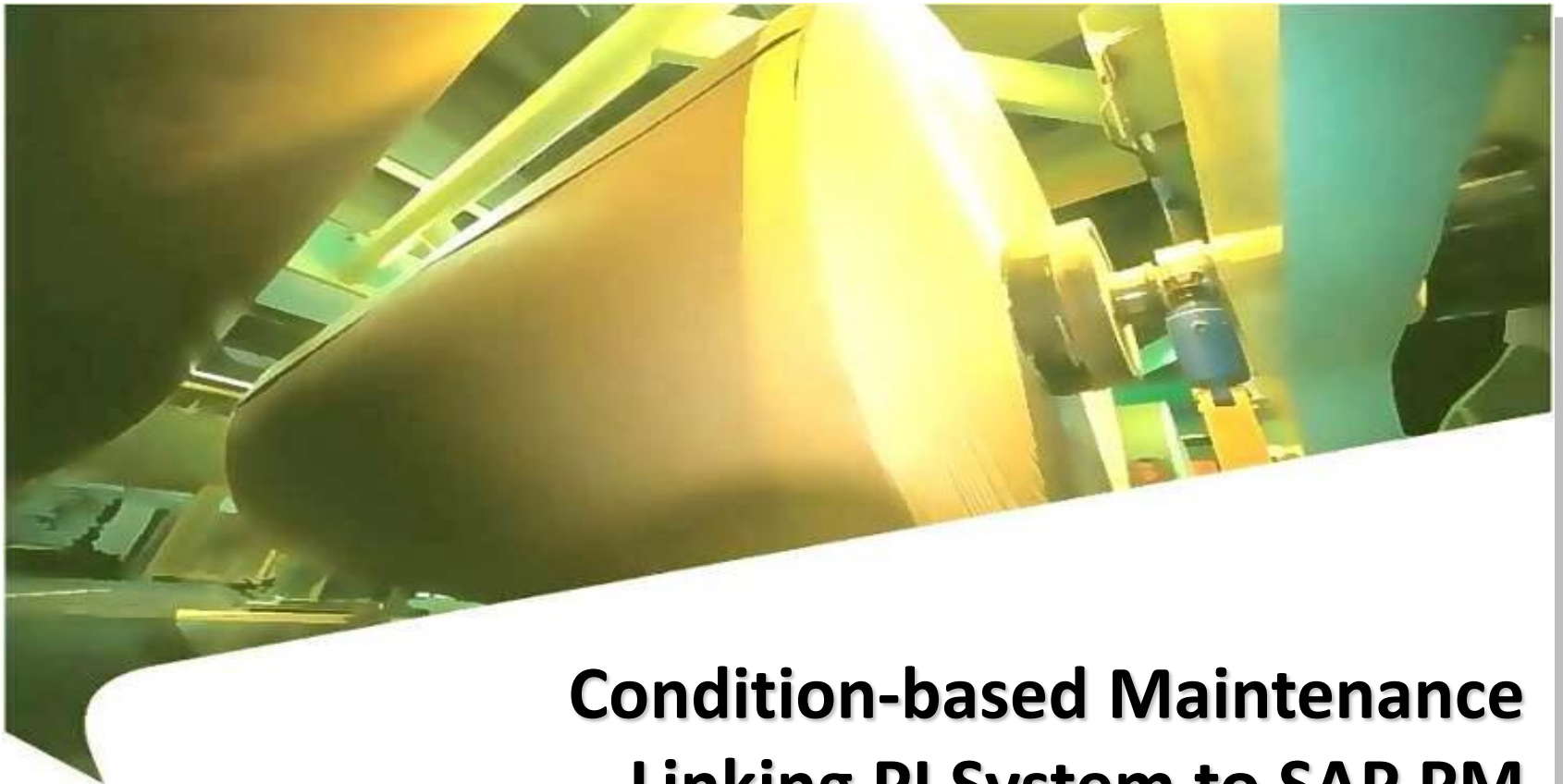
D	Av	T	Pondera.	Classe d.	Especificações	Resultado	Texto breve para caract...	Def.	Quota	S	Avaliação	Op	Car	Qtd.de controle	U	Origen

Decision Fields (circled in red):

- Avaliação code: Aceito (OK)
- Code DU: A (DU-PRD) Aprovado
- Índice de qtd.: 100 (do code de decisão de utilização)
- Ação subseq.

Results from integrating Acquidata – PI System to SAP QM

- ✓ **Eliminated manual data entry into SAP**
- ✓ **Eliminated the human errors associated with the same;**
- ✓ **Decreased decision-making time for disposition of rolls;**
- ✓ **Increased overall operational performance on PM #16;**
- ✓ **Increase overall paper laboratory efficiencies;**



Condition-based Maintenance Linking PI System to SAP PM

Project Overview and Goals

Problem: Equipment downtime

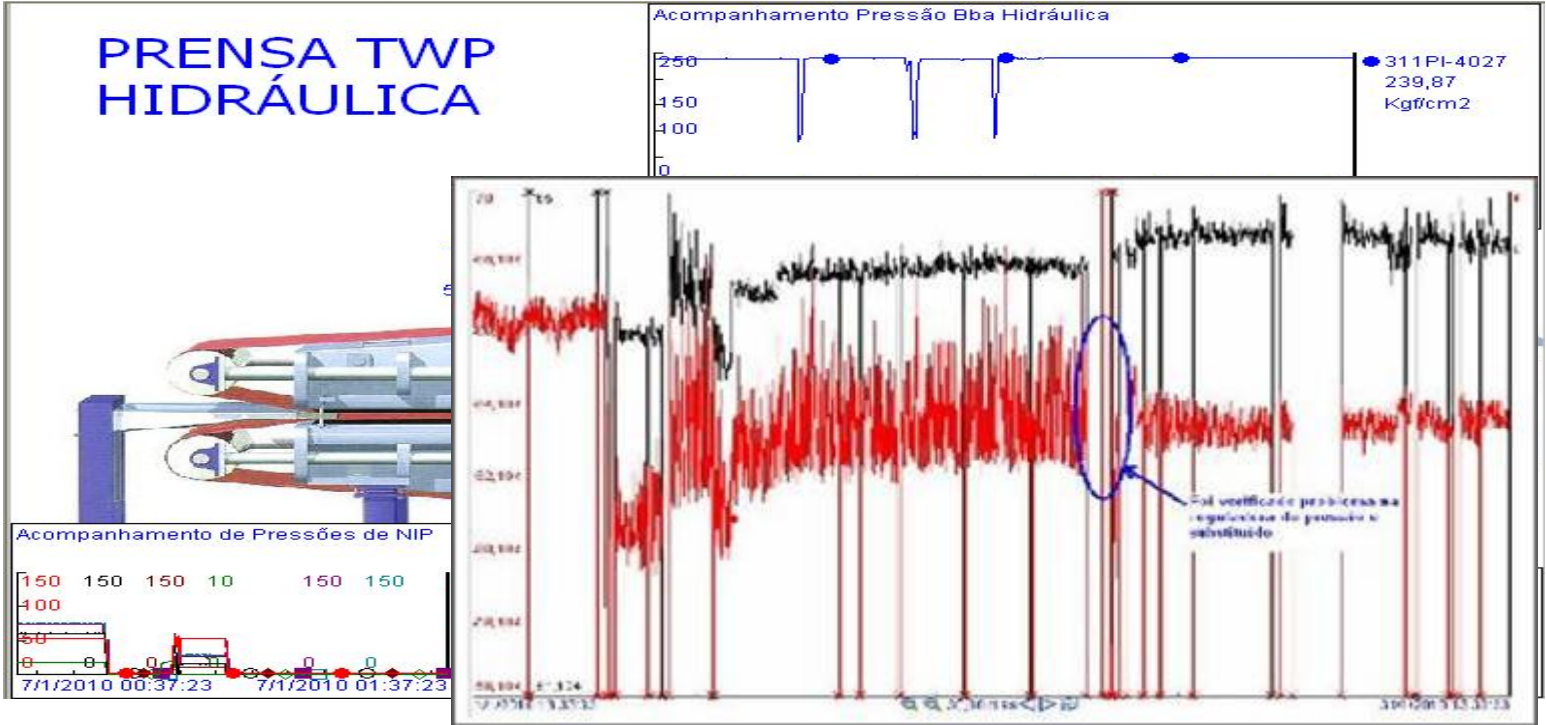
Example:

> Paper Machine #16 – High Consistency Refining Failures
103 hours (US\$ 750,000)

Solution:

- > Use PI System data for monitoring various process areas and machines
- > Catch failures BEFORE they happen using alarms
- > Integrate alarms from PI System to SAP PM

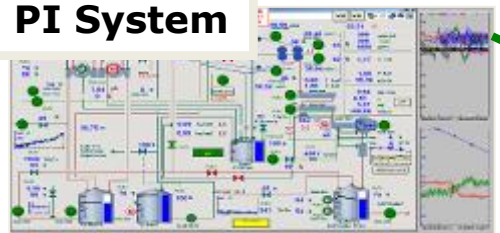
Example of equipment failure



Data sources for alarm definition

Systems used to collect data

PI System



OEE (MII)



SAP

Operational Occurrences

Sharepoint - GME SC

Spreadsheet created by the improvement team



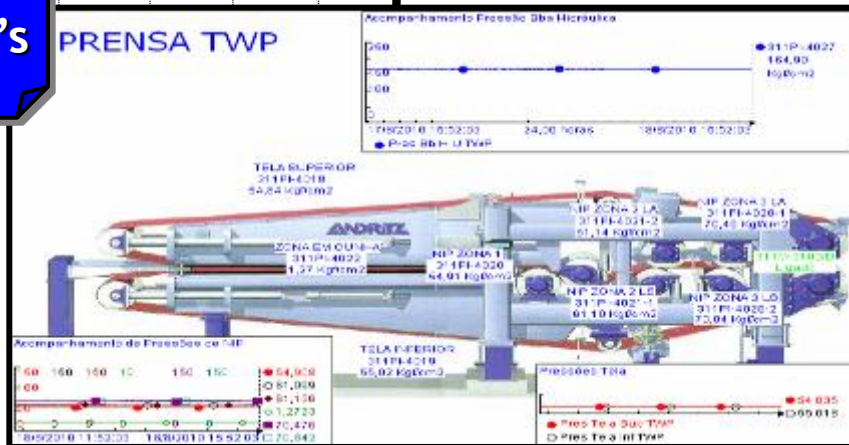
Group of Alarms by Area

Grouping of tags

TAG'S TWP

STATUS		IDENTIFICAÇÃO										
CONTROLE	MANUT / TEMPO CONT.AUTO	Área	TAG	Descrição	Valor atual	Valor ideal	Limite min.	Limite máx.	Última Manut.	Período Manut.	Manut. Prev.	Tempo func.
Dentro Faixa	OK	311	311LC-3009	Nivel Tq 1	74,6	75,0	70,0	80,0	14/11/2009	365	14/11/2010	277
Fora Faixa	OK		311LCV-3009	Valv Nivel Tq 1	45,5	54,0	47,0	81,0	14/11/2009	365	14/11/2010	277
Dentro Faixa	NA		311LC-3009/SP	SP Nivel Tq 1	75,0	70,0	70,0	80,0	NA	NA	NA	NA
Auto	OK		311LC-3009/MD	Nivel Tq 1	Auto	Auto	97,0	NA	NA	NA	NA	100
Normal	NA		311LC-3009/LL	Nivel Baixo Tq Massa 1	NA	NA	NA	NA	NA	NA	NA	NA
Dentro Faixa	OK		311	311CC-3080	Consist Entr Engrossadores	NA	NA	NA	NA	NA	NA	NA
Dentro Faixa	OK	311	311FI-3005	Vazao Massa Dep p/ Filtr Engros	NA	NA	NA	NA	NA	NA	NA	NA

117 TAG'S



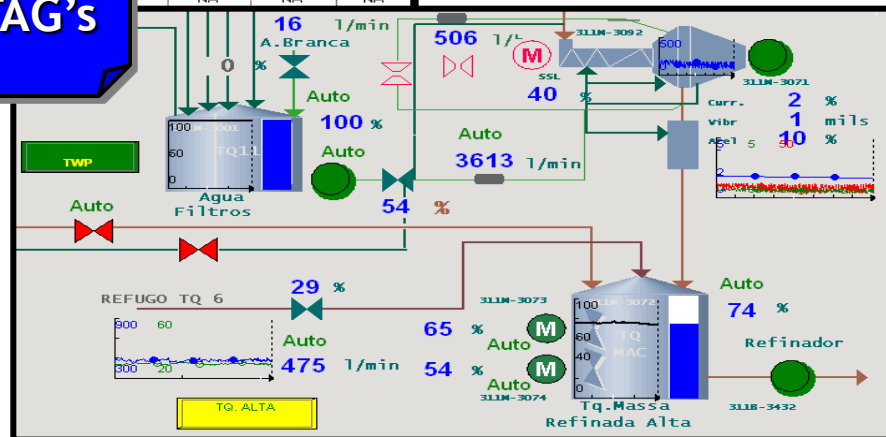
Group of Alarms by Area

Grouping of tags

TAG'S TQ7

STATUS		IDENTIFICAÇÃO										
CONTROLE	MANUT / TEMPO CONT.AUTO	Área	TAG	Descrição	Valor atual	Valor ideal	Limite min.	Limite máx.	Última Manut.	Período Manut.	Manut. Prev.	Tempo func.
Dentro Faixa	OK	311	311LC-3009	Nivel Tq 1	74,6	75,0	70,0	80,0	14/11/2009	365	14/11/2010	277
Fora Faixa	OK		311LCV-3009	Valv Nivel Tq 1	45,5	54,0	47,0	61,0	14/11/2009	365	14/11/2010	277
Dentro Faixa	HA		311LC-3009/SP	SP Nivel Tq 1	75,0	75,0	70,0	80,0	NA	NA	NA	NA
Auto	OK		311LC-3009/MD	Nivel Tq 1	Auto				NA	NA	NA	100
Normal	HA		311LC-3009/LL	Nivel Baixo Tq Massa 1	Normal				NA	NA	NA	NA
Dentro Faixa	OK	311	311CC-3080	Consist Entr Engrossadores	3,80							
Dentro Faixa	OK	311	311FI-3005	Vazao Massa Dep p/ Filt Engros	5296,21							

77 TAG's



Spreadsheet for Alarm monitoring

Microsoft Excel - Monitoramento Equipamentos RAC

Arquivo Editar Exibir Inserir Formatar Ferramentas Dados Janela PI Ajuda

Digite uma pergunta

STATUS		Área	TAG	CCM	Descrição	Valor atual	Valor ideal	Limite mín.	Limite máx.			
Status Manut.												
Dentro Faixa	NA	311	311M-3005I	CD 71.04.12	Corrente Agit Tq 1	48,6	50	45	55			
Normal	NA		311M-3005I		Valores alarmes sobrecarga Agi Tq 1	0	0	NA	10			
Subcarga	NA		311M-3005I		Valores alarmes subcarga Agi Tq 1	30	0	NA	10			
Preditiva	Preventiva		311M-3005/D		Motor Agit Tq 1 - Elétrica	NA	NA	NA	NA			
Preditiva	Preventiva		311M-3005/D									
Auto	OK		311M-3005MD									
Normal	NA		311M-3005/CCM									
Fora Faixa	NA		311M-3026I									
Normal	NA		311M-3026I									
Normal	NA		311M-3026I									
Preditiva	OK		311M-3026/D									
					Preditiva				Preventiva			
					Última Manut.	Período Manut.	Manut. Pred.	Tempo func.	Última Manut.	Período Manut.	Manut. Prev.	Tempo func.
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					1/8/2010	90	vencido	NA	1/8/2010	90	vencido	100
					5/8/2010	30	vencido	NA	1/8/2010	90	vencido	183
					NA	NA	NA	100	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					NA	NA	NA	NA	NA	NA	NA	NA
					1/8/2010	90	vencido	NA	1/8/2010	365	1/8/2011	NA

187 Normal NA

188 Normal NA

189 Normal NA

190 Preditiva OK

191 Preditiva Preventiva

192 Preditiva Preventiva

193 Auto OK

194 Preditiva OK

195 Preditiva Preventiva

196 Preditiva Preventiva

CD 71.04.12

CD 71.07.12

CD 71.09.23

Val Rosco Alim

Carga Balsa Pa

Ribbon Feeder 1

Motor Bbs Pulp

Motor Bbs Pulp

Bbs Palper Mot

bbs Palper Mot

Motor Bbs Águ

Motor Bbs Águ

Bbs Águas Selag

ALM / CNT / MOT

Pronto

Calcula

Monitoramento RAC

Microsoft Excel - [...]

Microsoft PowerPoint - [...]

Imagem - [...]

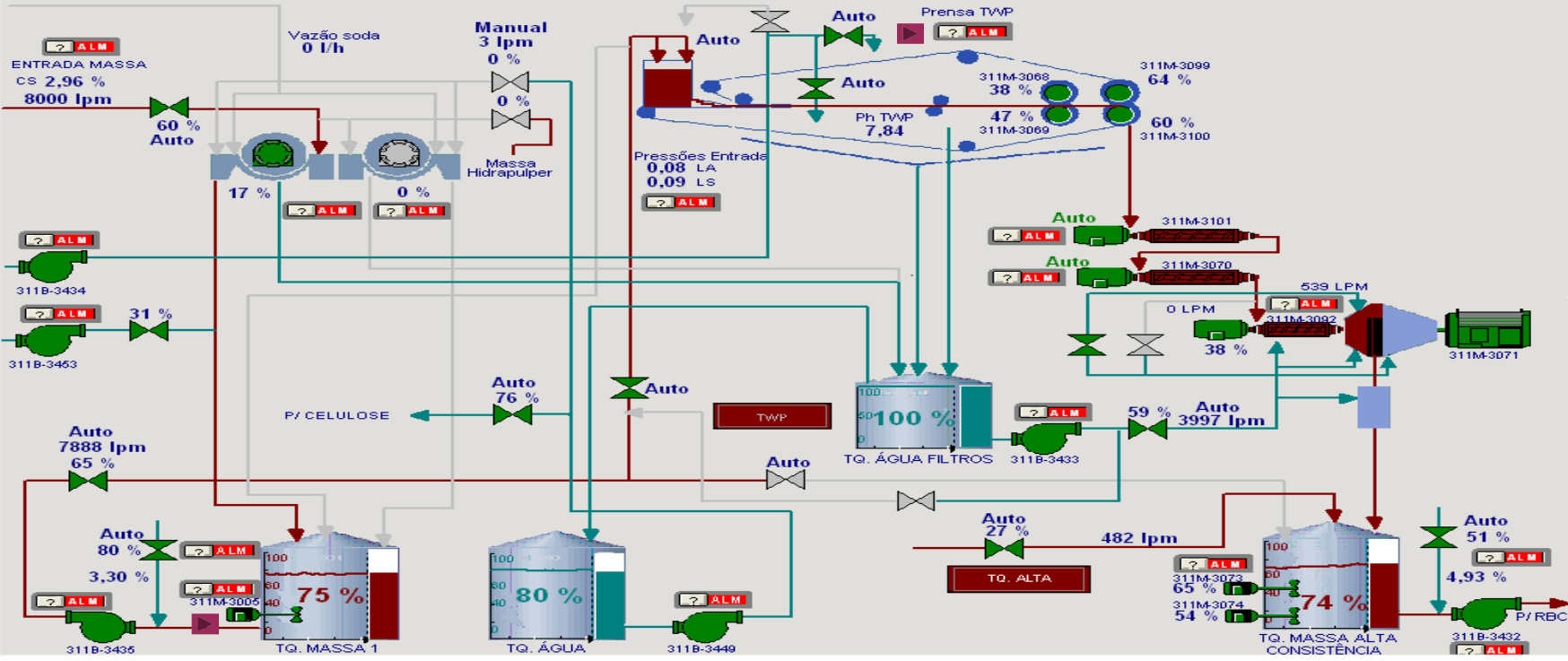
09:41



Monitoring, analysis, and a better mapping of assets



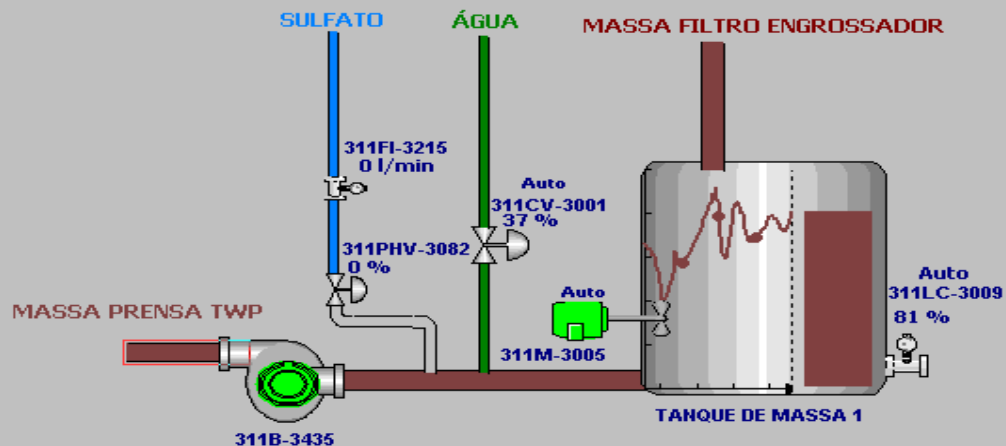
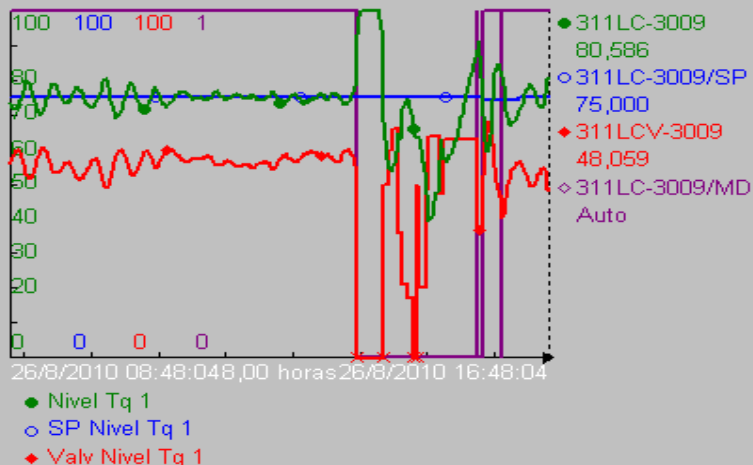
REFINAÇÃO DE ALTA CONSISTÊNCIA



Monitoring detail display

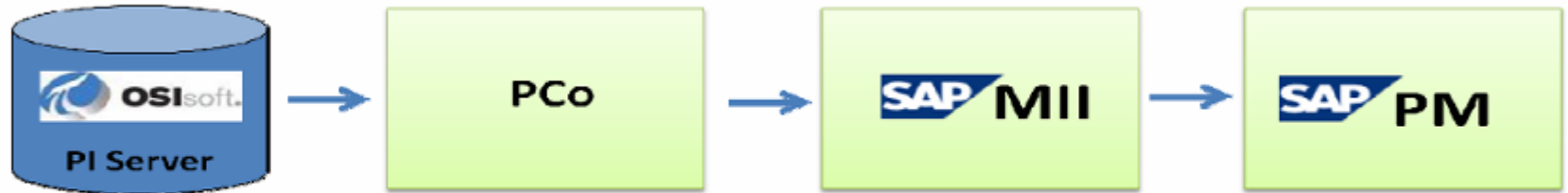
311LC-3009 - NÍVEL TANQUE DE MASSA 1

CONTROLE	MANUT / TEMPO CONT.AUTO	Área	TAG	Descrição	Valor atual	Valor ideal	Limite mín.	Limite máx.	Última Manut.	Período Manut.	Manut. Prev.	Tempo func.
Dentro Faixa	OK	311	311LC-3009	Nível Tq 1	72,4	75,0	70,0	80,0	14/11/2009	365	14/11/2010	285
Dentro Faixa	OK		311LCV-3009	Valv Nível Tq 1	53,8	54,0	47,0	61,0	14/11/2009	365	14/11/2010	285
Dentro Faixa	NA		311LC-3009/SP	SP Nível Tq 1	75,0	75,0	70,0	80,0	NA	NA	NA	NA
Auto	Abaixo do limite		311LC-3009/MD	Nível Tq 1	Auto	Auto	97,0	NA	NA	NA	NA	91
Normal	NA		311LC-3009/LL	Nível Baixo Tq Massa 1	Normal	Normal	NA	NA	NA	NA	NA	NA



Integration of the PI System to SAP PM

Objective: Implement the integration between the PI System and SAP PM through SAP MII 11.5, for automatically creating maintenance notifications based upon on-line monitoring of about 150 PI Tags.



Nota: PCo – Plant Connector

Next Steps with the SAP PM interface

- Installation and Configuration of PCo (Plant Connectivity) 2.0
- Definition of the 150 PI Tags to be monitored (with limits)
- Tests with the SAP RFC for notification creation in PM
- Deployment in the Production environment in one Paper Plant (pilot)

Summary of Results

- Availability of High Consistency Refining of PM #16 was increased
- Maintainers and operators had their skills to use the PI System developed
- Improved system security
- Online monitoring of process and equipment.
- Fast diagnosis of problems
- Total savings of 750,000 USD per year



Thank you

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into **action.**