



# PI System as an Aid for Prevention and Control of Pollution

Presented by **Michele Albicocchi**



# PI System as an Aid for Prevention and Control of Pollution

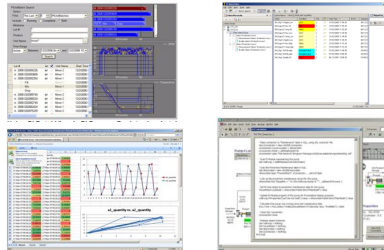
*PI System tracks all warning or alarm events that must be justified by plant operators in the context of continuous improvements of plant environment impact and more over keeps people informed of the evolving situation.*



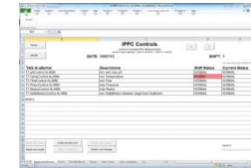
## Business Challenge



## Solution



## Results and Benefits





# Group profile – who we are

## A major global player in Chemicals with compelling



Created by Ernest Solvay in 1863, Solvay is a **Global** company, with historical anchorage in Europe, and headquartered in Brussels.

## Our strengths

- 90% of sales in businesses among the top 3 global leaders
- ~ 40% of sales in fast growing markets
- **Balanced portfolio** of activities
- A culture of **sustainability, innovation and operational excellence**

**€12.4bn**  
NET SALES

**€2.1bn**  
Adjusted  
REBITDA

**111**  
MAJOR  
INDUSTRIAL  
SITES

**13**  
MAJOR R&I

**29,100**  
EMPLOYEES  
55 COUNTRIES

# A well balanced portfolio of end markets



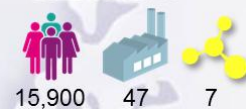
% of Group net sales (2012)

# Historical strength in fast-growing regions



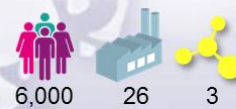
## EUROPE

**42%** sales



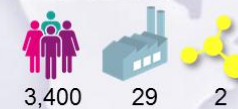
## ASIA PACIFIC & REST OF THE WORLD

**28%** sales



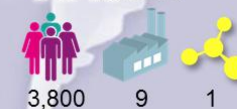
## NORTH AMERICA

**20%** sales



## LATIN AMERICA

**10%** sales



Fast growing markets

**~40%**

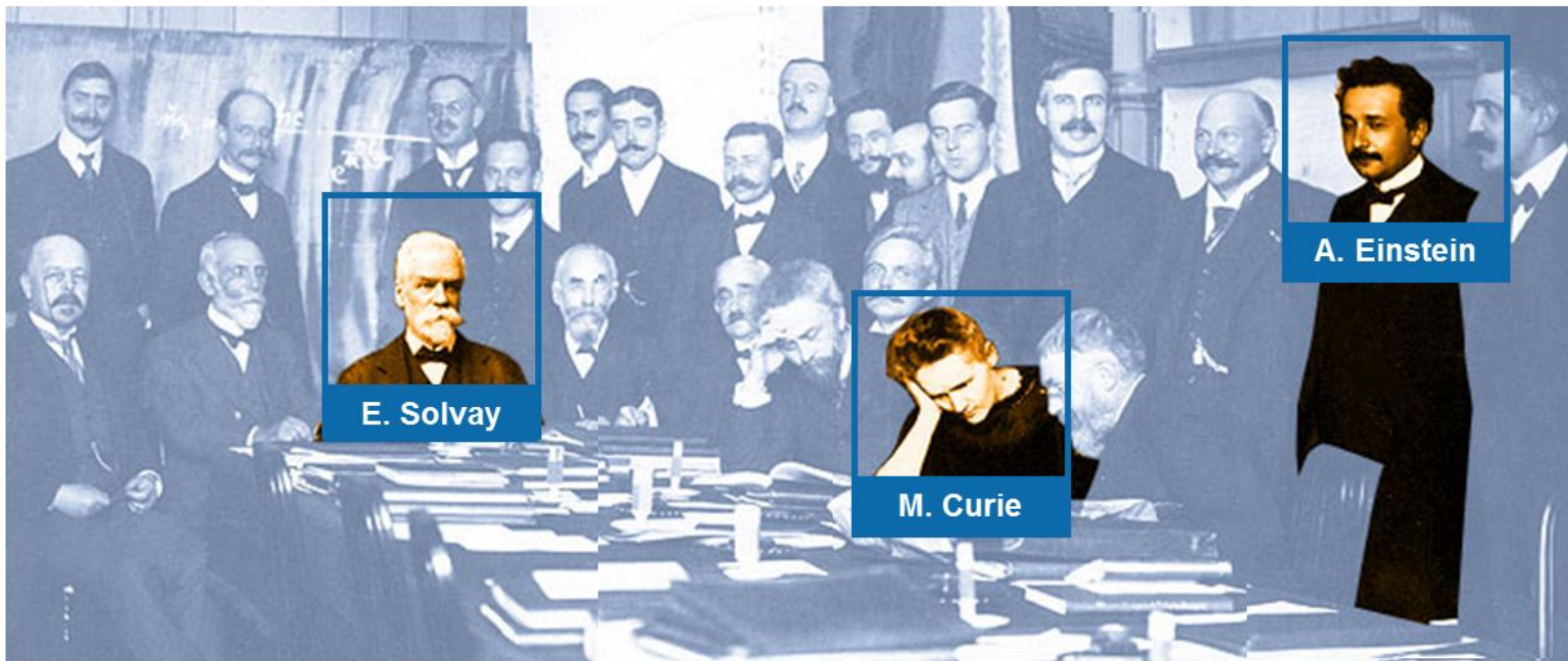
of net sales

**50%**

of growth investments

2012 figures





The first **Solvay Physics Conference** in 1911, included 8 Nobel prize winning chemists and physicists: Marie Curie, Albert Einstein, Onnes Kamerlingh, Hendrik Lorentz, Walther Nernst, Max Planck, Ernest Rutherford, Jean Perrin

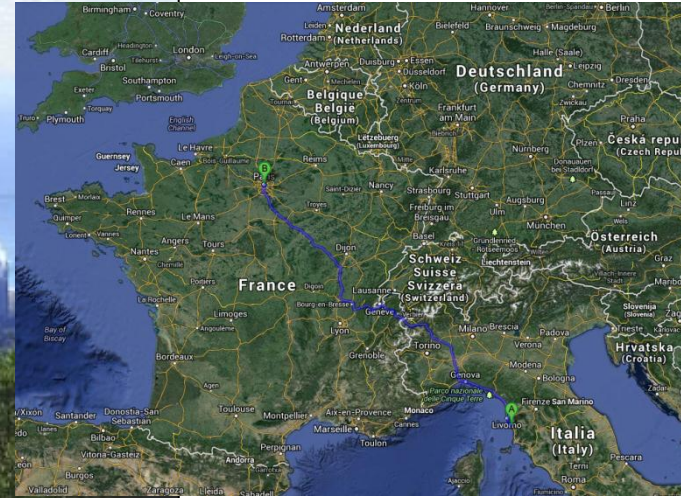
# Rosignano factory

## Historical notes

- Building start 1912
- Production start 1917

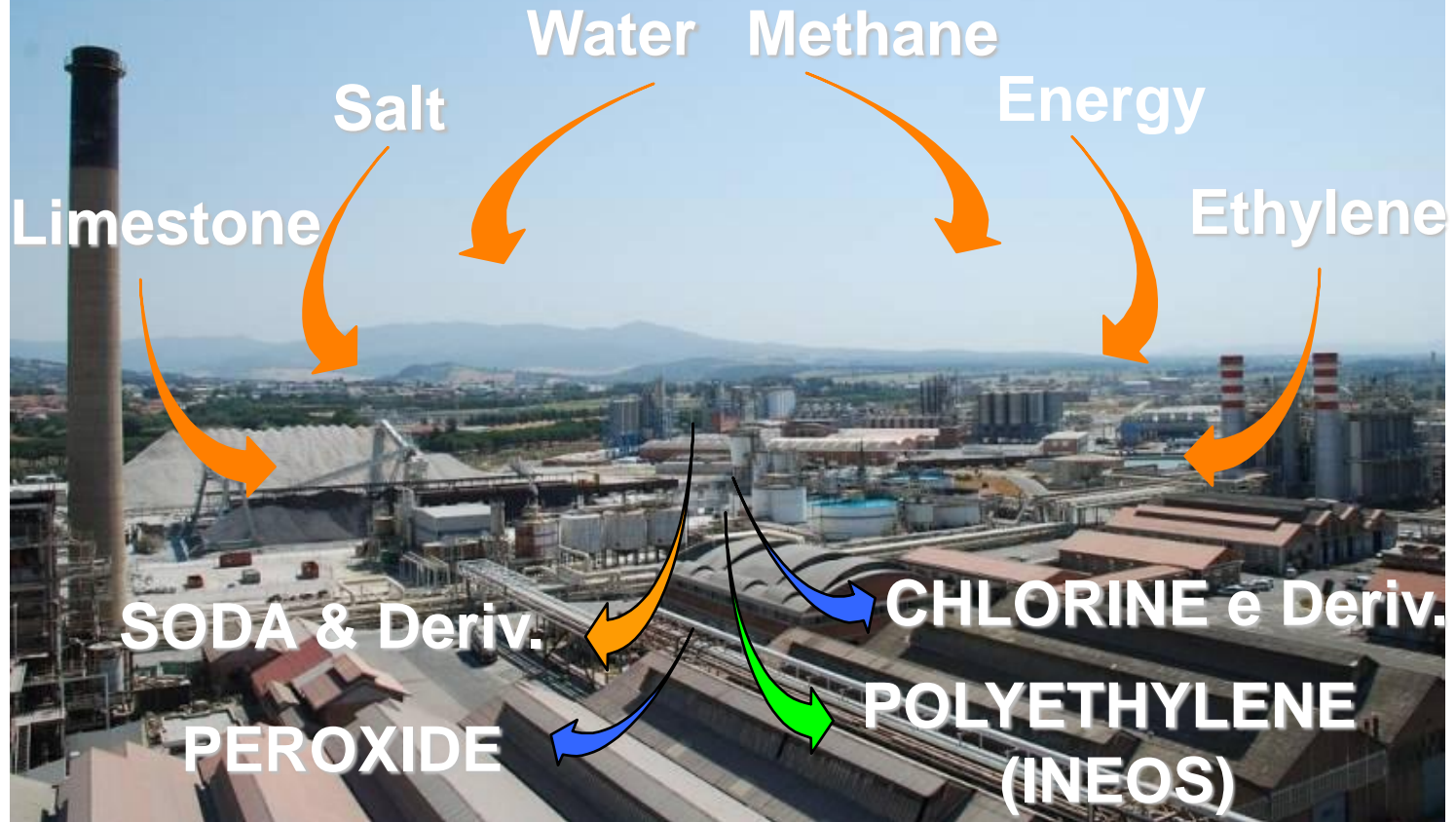
## Current situation

- The factory occupies 2.2 km<sup>2</sup>
- Sales: 264 M€
- Investments and maintenance: 35 M€
- People: 628 directly employed  
380 indirectly " "





# Productions





# Production Capacity

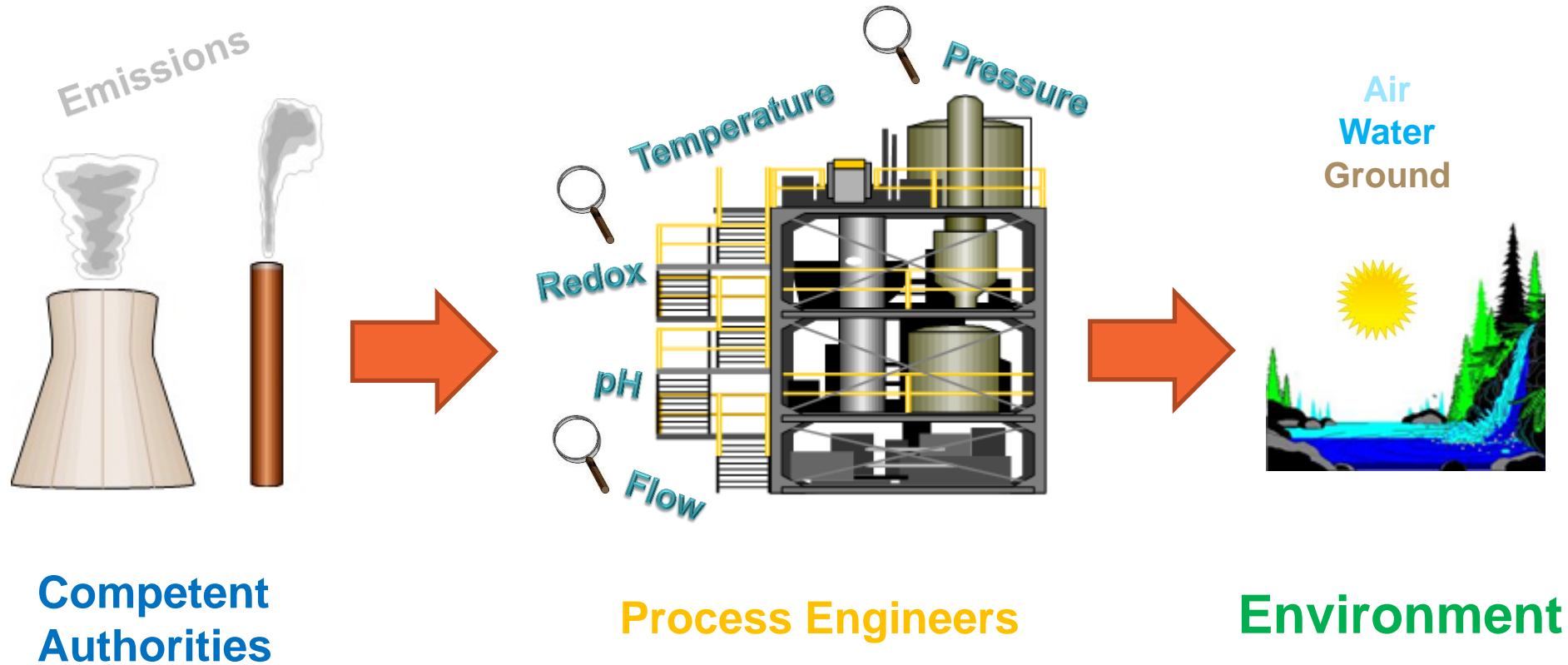


<b>Soda ash</b>	<b>940 kT / year</b>
<b>Sodium Bicarbonate</b>	<b>260 kT / " "</b>
<b>Calcium Chloride</b>	<b>120 kT / " "</b>
<b>Caustic Soda</b>	<b>190 kT/ " "</b>
<b>Chlorine and derivatives</b>	<b>300 kT/ " "</b>
<b>Hydrogen Peroxide</b>	<b>35 kT / " "</b>
<b>Sodium Percarbonate</b>	<b>50 kT/ " "</b>

# Integrated Pollution Prevention and Control (IPPC)

- European Strategy to improve environmental performances
- European Directive 2008/1/EC and later 2010/75/EU
- List of Activities and Substances to keep under control
- Emission Limit Values based on Best Available Tech (BAT)
- Competent Authorities check all preventive pollution control measures have been laid down before granting a permit to any operation

# Variables under Control (IPPC)



# PI System as an aid to control pollution

## Help for IPCC



It keeps under control those process parameters that have a direct influence on emissions related to IPPC permit

## Help for Environmental Certification (ISO 14001)

By registering all abnormal conditions you can analyze them and set a process of continuous improvement

**If you have an ISO 14001 certification you got a longest IPPC permit**



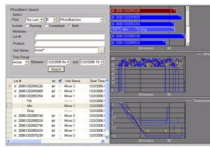
# Our solution (legacy PI System)

**PI Server**



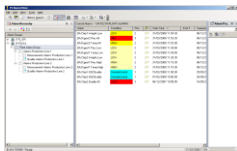
To archive Process, Calculated and Alarm Tags

**PI Batch**



To register Events

**PI AlarmView**



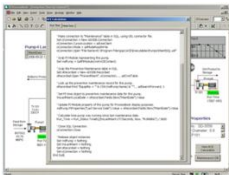
To notify control room conductors

**PI DataLink**



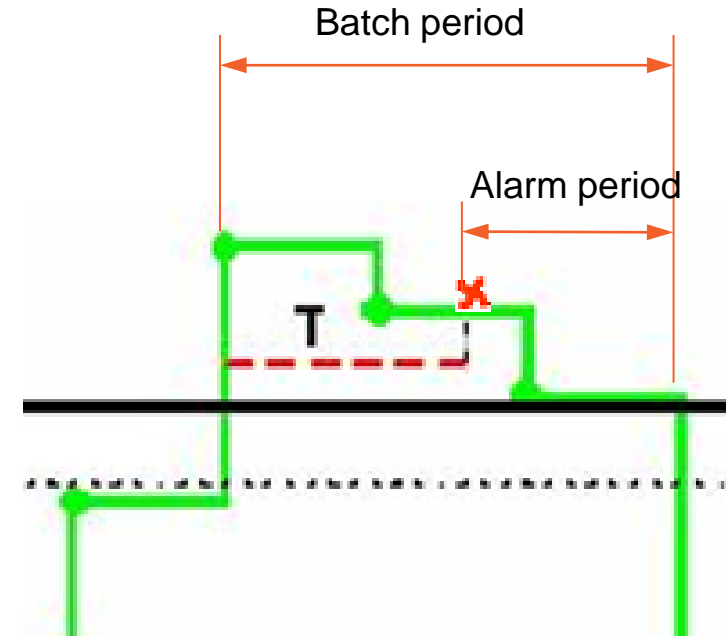
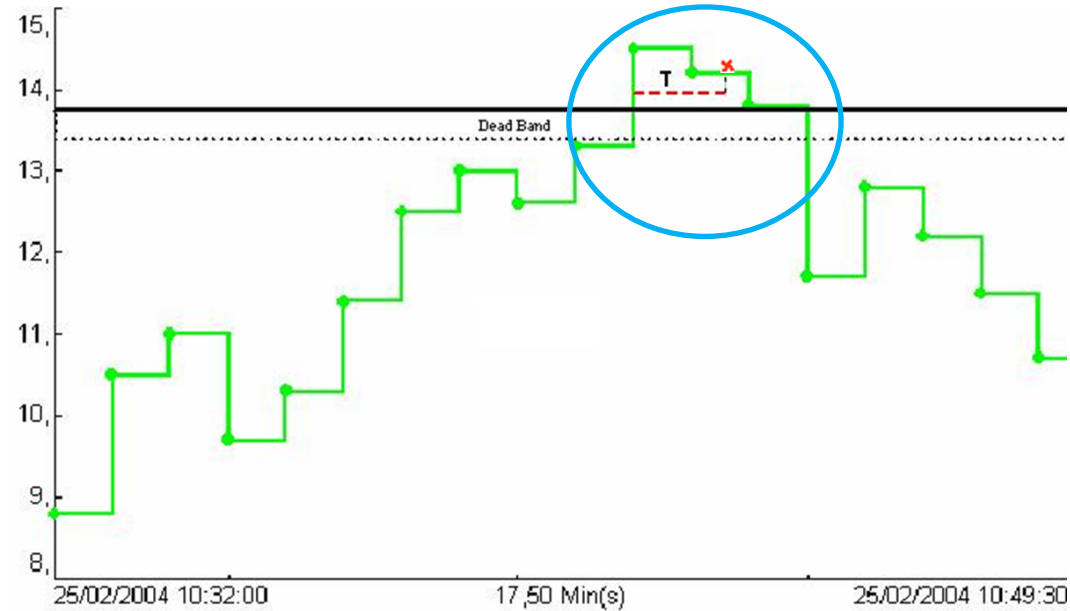
To report warning or alarm events

**PI ACE**

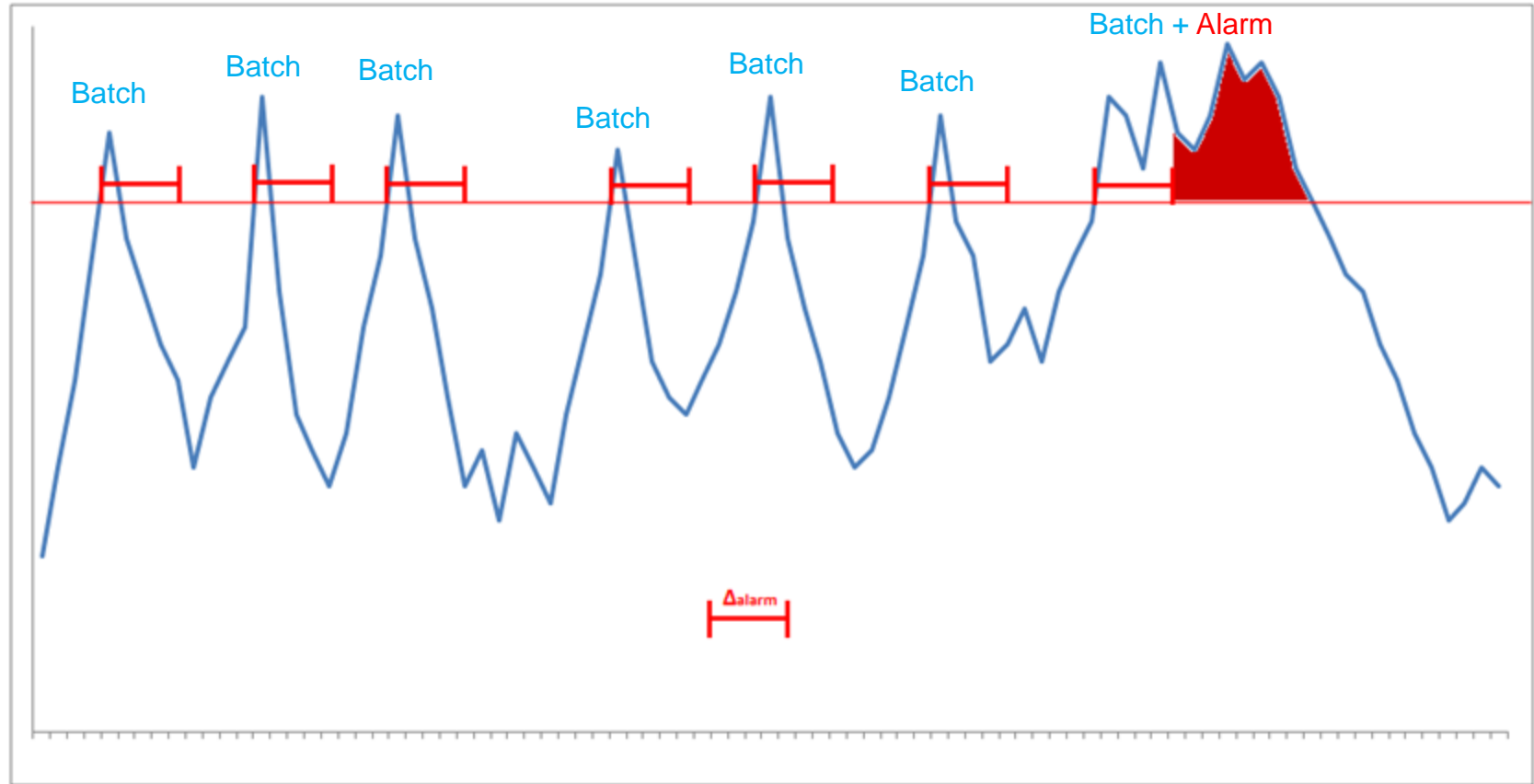


To send Alarm Notifications via e-mail/sms/etc.

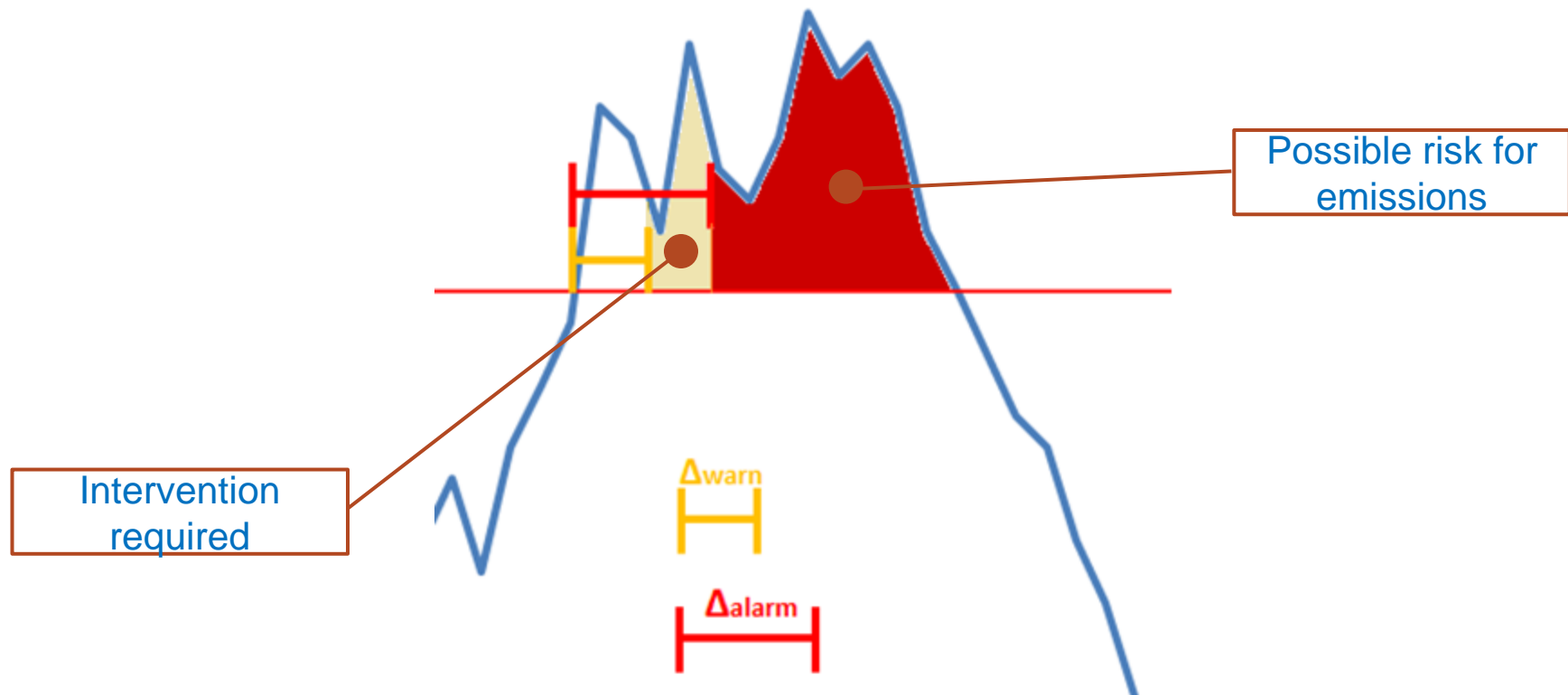
# Batch and Alarm Periods



# Batch and Alarm Periods



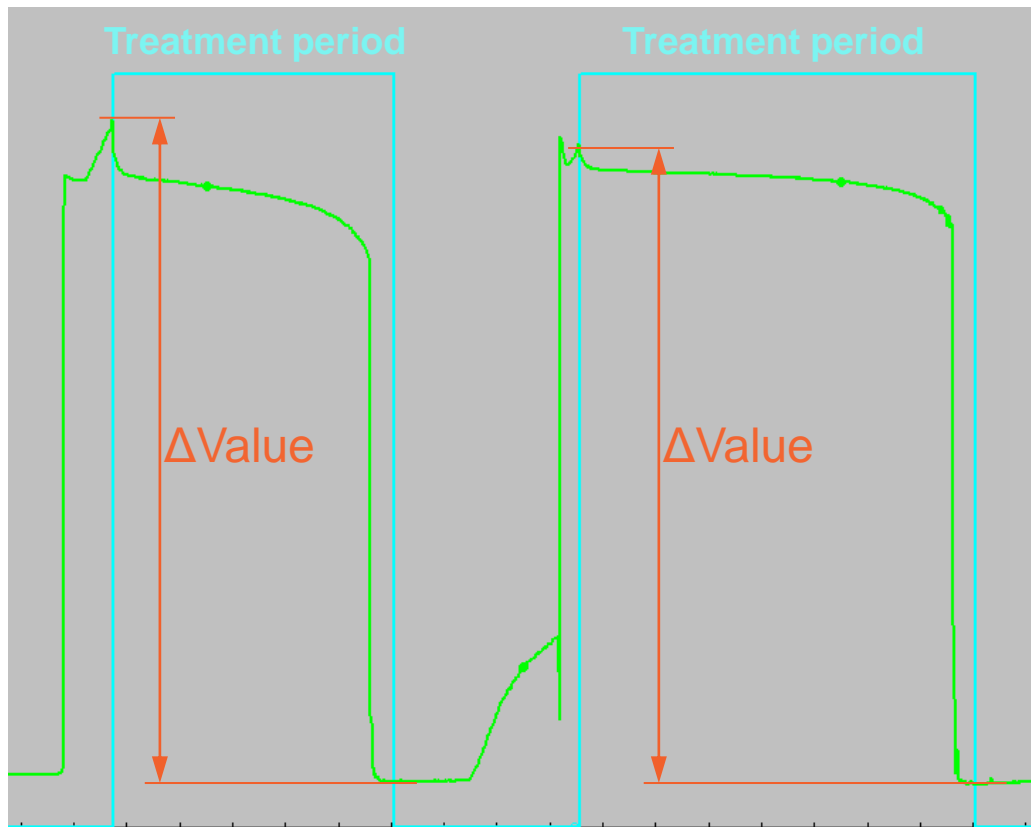
# Alarm/Warning Periods



Warnings and Alarms differ only on the delay time ( $\Delta_{alarm} > \Delta_{warning}$ )



# Treatment Efficiency



As an example, a Neutralization treatment is effective when a Delta Value is over a certain limit.

If ineffective, an alarm condition is kept from the end of the treatment until the beginning of the next one.

A similar control can be easily configured and reported in PI System. For configuration we mostly use PI PE and PI Alarm Tags.

# PI AlarmView

The screenshot displays the PI AlarmView application window. The interface is divided into several panes:

- Alarm Hierarchy:** A tree view on the left showing the organizational structure of alarms, including groups like 'ITR\_SPI', 'Gruppo Allarmi Clorometani', and 'IPPC Test Group'.
- Current Alarms - WTR\_SPI\TT-ALARMS\TT:IPPC:** A central table listing active alarms with columns for Alarm name, Condition, Priority, Start Time, and Sequence Start.
- Alarm Properties:** A detailed view on the right for the selected alarm 'TT.PressControl.ALARM', showing fields like AlarmGroup, AlarmType, Description, and various test parameters.
- Displayed Servers:** A section at the bottom right showing a list of servers, with 'ITR\_SPI' currently selected.

Alarm	Condit...	Prio...	Start Time	Sequence Start
TT.PressControl.ALARM	HIHI	3	16/07/2013 16:00:57	16/07/2013 15:59:47
TT.TempControl.ALARM	LOLO	3	16/07/2013 15:56:20	10/07/2013 14:01:00
TT.FlowControl.ALARM			09/07/2013 10:42:14	

The status bar at the bottom indicates the user 'EUJAIT83456' is ready, and the current time is 16/07/2013 16:15:44.

Final users (like control room conductors) are also notified via PI AlarmView.

They must acknowledge any warning or alarm condition.

# PI DataLink

ShiftIPPCAlarms.xls [modalità compatibilità] - Microsoft Excel

File Home Inserisci Layout di pagina Formule Dati Revisione Visualizza Sviluppo Componenti aggiuntivi PI DataLink Team

Current Archive Value Value Compressed Sampled Timed Calculated Data Value Value Calculation Search Properties Update Settings Insert Trend Point ID to Tag Attribute Mask to Tag Tag Functions Module Browse Alias to Tag Property to Value Module Database

E38

Reset

Update

**IPPC Controls**

Control of sensible IPPC Measurements

Period of alarm detection: 16/07/13 13:00:00 - 16/07/13 21:00:00

DATE: 16/07/13

SHIFT: 2

Last control timestamp: 16/07/2013 10:00:46

TAG di allarme	Descrizione	Shift Status	Current Status
TT:pHControl.ALARM	min and max pH	NORMAL	NORMAL
TT:TempControl.ALARM	min Temperature	ALARM	NORMAL
TT:FlowControl.ALARM	min Flow	NORMAL	NORMAL
TT:PressControl.ALARM	max Pressure	NORMAL	WARNING
TT:RedoxControl.ALARM	max Redox	NORMAL	NORMAL
TT:DeltaRedoxControl.ALARM	min DeltaRedox between begin/end treatment	NORMAL	NORMAL

NOTES:

Enable/Disable auto update

Enable/Disable automatic print

Enable/Disable vocal message

Enable auto-update

Enable automatic print

Enable vocal message

Disable auto-update

Disable automatic print

Disable vocal message

Signature:

RapportoDiTurno Eventi EventDiAllarme Modulo Alarm State Stato Analizzatori

Pronto

Main MS Excel Book for Notification and Reporting.

Shift browsing (back/forth) buttons

Alarm Status currently and during the selected shift

# PI DataLink

ShiftIPPCAlarms.xls [modalità compatibilità] - Microsoft Excel

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Period of alarm detection: 16/07/13 13:00:00 - 16/07/13 21:00:00 Date: 16/7/2013

Start date	End Date	EVENT	CAUSE OF EVENT	EVENT MANAGEMENT	CORRECTIVE ACTION
16/07/13 15:50:30	16/07/13 15:56:20	min Temperature(** Lolo)			
16/07/13 16:00:47	16/07/13 16:00:57	max Pressure(** Hihi)			

Modulo Alarm State Stato Analizzatori

We got the list of all alarm events in the selected shift.

Each event must be justified and discussed with process engineers to find out the reasons of abnormal behaviour.



# PI DataLink + PI BatchView

**Filter on Year and Length of Time**

**Parameter under control**

**Results**

**Summary per month**

Year	Limit	Min Length (min)
2013	All	1

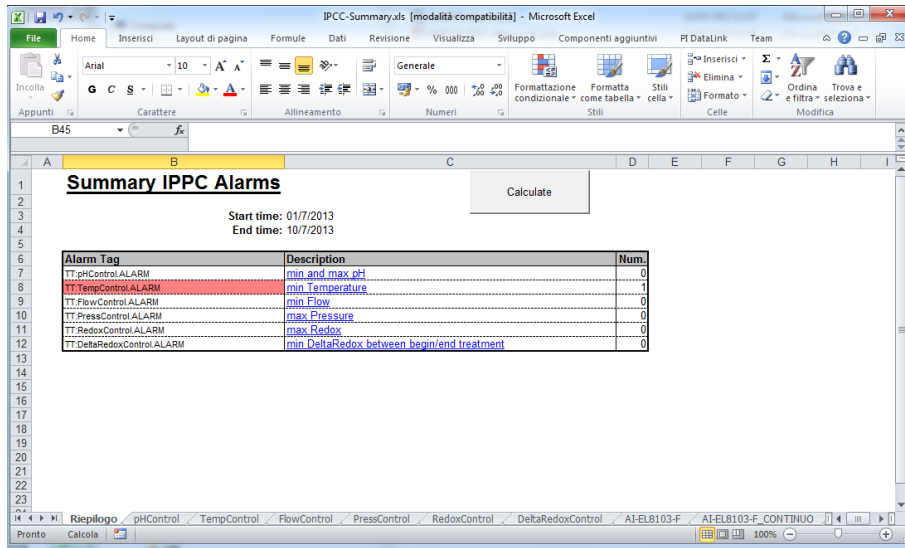
Parameter	Unit	Lim.Min	TMin	Lim.Max	TMax	Val	Start time	End time	Time(days hh min)	Hours	Month	Month	1
Temperature under control	°C	98.0		98.0		94.80	14/07/2013 17:16:00	14/07/2013 17:52:00	0 00 36	0.6	7	# Events	0
		98.0		98.0		96.70	14/07/2013 09:32:00	14/07/2013 09:43:00	0 00 11	0.2	7	Tot.Hours	0.0
		98.0		98.0		95.30	13/07/2013 00:07:00	13/07/2013 19:21:00	0 00 14	0.2	7		
		98.0		98.0		96.60	13/07/2013 03:35:00	13/07/2013 03:35:00	0 00 11	0.2	7		
		98.0		98.0		96.40	12/07/2013 16:59:00	12/07/2013 16:59:00	0 00 22	0.4	7		
		98.0		98.0		95.50	12/07/2013 06:21:00	12/07/2013 06:21:00	0 00 09	0.1	7		
		98.0		98.0		94.00	11/07/2013 14:45:00	11/07/2013 14:45:00	0 00 05	0.1	7		
		98.0		98.0		95.00	11/07/2013 04:15:00	11/07/2013 04:15:00	0 00 15	0.3	7		
		98.0		98.0		96.00	10/07/2013 18:10:00	10/07/2013 18:10:00	0 00 10	0.2	7		
		98.0		98.0		96.50	10/07/2013 14:30:00	10/07/2013 14:30:00	0 00 30	0.5	7		
		98.0		98.0		97.00	10/07/2013 09:30:16	10/07/2013 11:21:37	0 01 51	1.9	7		

Month	# of Events
1	0
2	0
3	0
4	0
5	0
6	0
7	11
8	0
9	0
10	0
11	0
12	0

We use some reports to look at all events passing thresholds for any possible length of time.

# PI DataLink

## Some summary reports

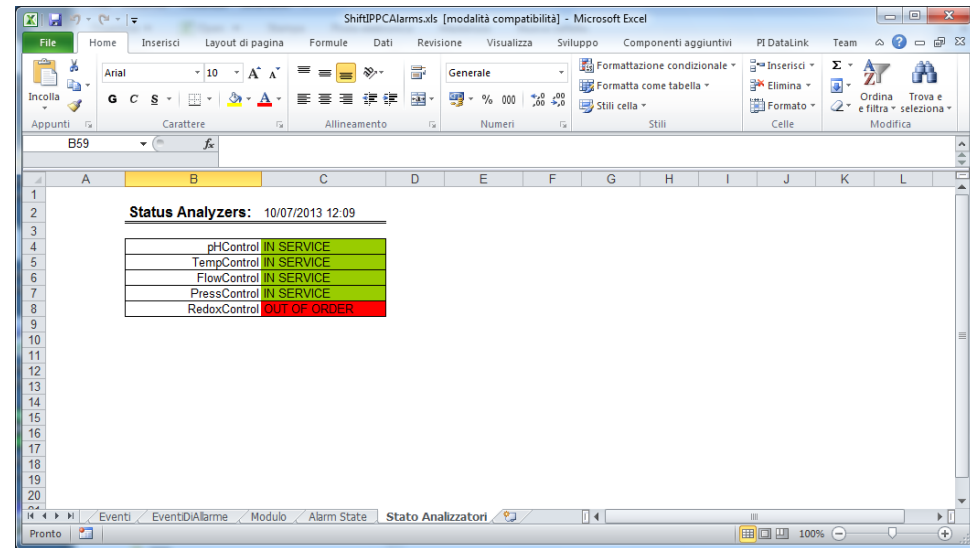


Summary IPPC Alarms

Start time: 01/7/2013  
End time: 10/7/2013

Alarm Tag	Description	Num.
TT.pHControl.ALARM	min and max pH	0
TT.TempControl.ALARM	min Temperature	1
TT.FlowControl.ALARM	min Flow	0
TT.PressControl.ALARM	max Pressure	0
TT.RedoxControl.ALARM	max Redox	0
TT.DeltaRedoxControl.ALARM	min DeltaRedox between begin/end treatment	0

List of alarm occurrences for the selected month.



Status Analyzers: 10/07/2013 12:09

pHControl	IN SERVICE
TempControl	IN SERVICE
FlowControl	IN SERVICE
PressControl	IN SERVICE
RedoxControl	OUT OF ORDER

Alarm testing can be disabled depending on the analyzer status. Such status is set at DCS/PLC level.

# PI DataLink

## Enable/Disable Alarm Test

IPPC\_Alarm\_Enable.xls [modalità compatibilità] - Microsoft Excel

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Current Value Single Value Archive Value Compressed Data Sampled Data Timed Data Calculated Data Time Filtered Search Properties Update Settings Insert Trend Point ID to Tag Attribute Mask to Tag Tag Functions Module Browse Alias to Tag Property to Value Module Database

E5

0 = Disable  
1 = Enable

UPDATE

**IPPC Alarms - Enable/Disable Alarms**

TAG	Descrizione	Current Value	New Value
TT:pHControl.EnableIPPCAlarm	Enable/Disable pH IPPC Alarm	1	
TT:TempControl.EnableIPPCAlarm	Enable/Disable Temperature IPPC Alarm	0	
TT:FlowControl.EnableIPPCAlarm	Enable/Disable Flow IPPC Alarm	0	
TT:PressControl.EnableIPPCAlarm	Enable/Disable Pressure IPPC Alarm	1	
TT:RedoxControl.EnableIPPCAlarm	Enable/Disable Redox IPPC Alarm	1	
TT:DeltaRedoxControl.EnableIPPCAlarm	Enable/Disable DeltaRedox IPPC Alarm	1	

Foglio1 Foglio2 Foglio3

Pronto

Set  
0 to disable  
1 to enable

# PI DataLink + PI SDK

IPPC\_EditParameters.xls [modalità compatibilità] - Microsoft Excel

File Home Inserisci Layout di pagina Formule Dati Revisione Visualizza Sviluppo Componenti aggiuntivi PI DataLink Team

Comandi menu

A36

Tag Allarme:			
TT:pHControl.ALARM			
min and max pH			
Attributi	Definizione corrente	Nuovi valori	Last update
test1	GT('TT:pHControl.HIGHLIMIT+TMAX') + 3m	tempo (minuti) =	15/07/13 17:58:02
action1	Hihi 3		
test2	GT('TT:pHControl.HIGHLIMIT+TMAX') + 1m	tempo (minuti) =	15/07/13 17:58:02
action2	High 2		
test3	LT('TT:pHControl.LOWLIMIT-TMIN') + 3m	tempo (minuti) =	15/07/13 17:58:02
action3	Lolo 3		
test4	LT('TT:pHControl.LOWLIMIT-TMIN') + 1m	tempo (minuti) =	15/07/13 17:58:02
action4	Low 2		
SourceTag		TT:pHControl_C	
Formula IF (TT:pHControl.EnableAlarm = 1) THEN 'TT:pHControl' ELSE 7			
Limite Minimo	5.0	Valore minimo:	09/07/13 10:30:13
Limite Massimo	9.0	Valore massimo:	09/07/13 10:30:24
DeadBand	0.00	Valore:	09/07/13 09:58:05
Toll. su Min	0.2	Valore minimo:	09/07/13 10:30:47
Toll. su Max	0.3	Valore massimo:	09/07/13 10:30:59
Tag limit		TT:pHControl.LOWLIMIT = 5.0 - 0.2 TT:pHControl.HIGHLIMIT = 9.0 + 0.3	
ControlTag			
Formula			
UPDATE			

Foglio1 Anagrafica TagAllarmi Foglio3

Pronto

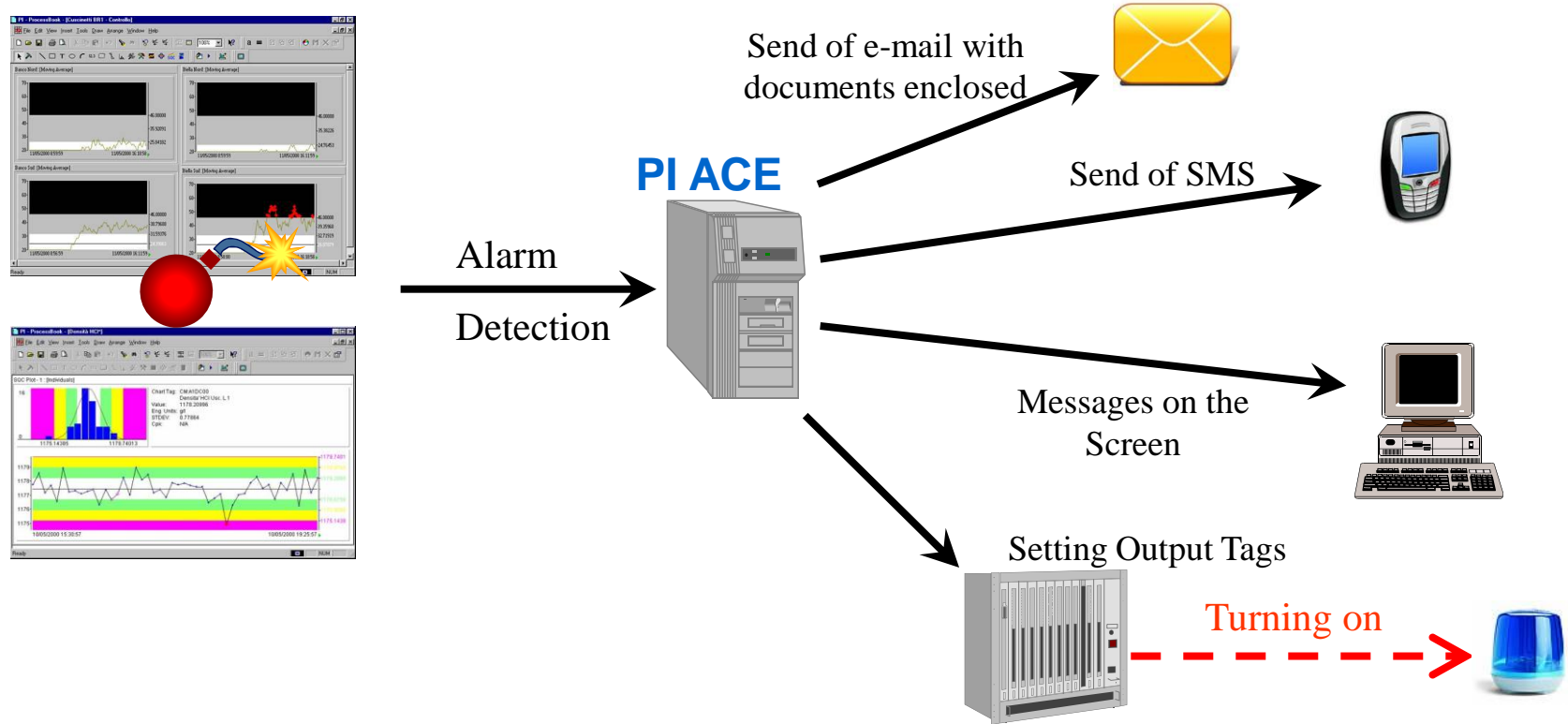
Alarm configuration editing made by the end user.

Delays of the persistent conditions to generate warnings/alarms

Alarm Limits



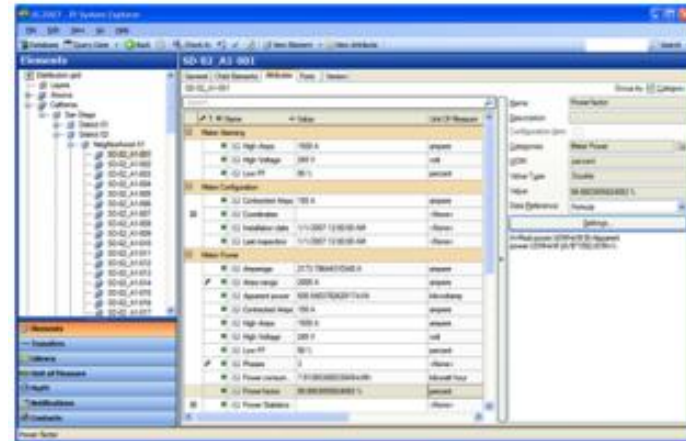
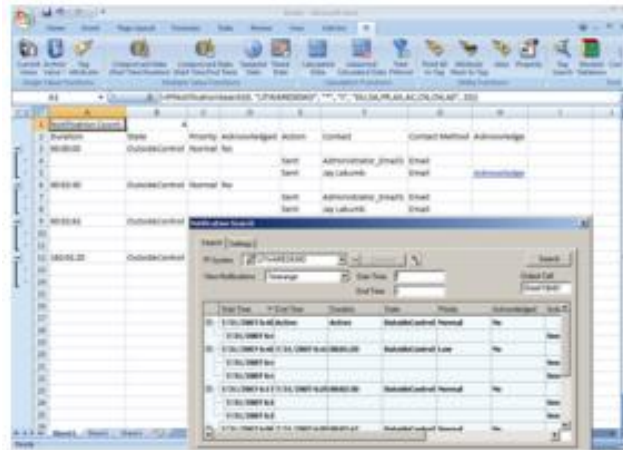
# Notification means



We built our PI ACE application when PI Notifications did not exist

# Future

## Exploring PI AF/PI Event Frames + PI Notifications...



# Questions

# Michele Albicocchi

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Solvay Chimica Italia S.p.A.

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