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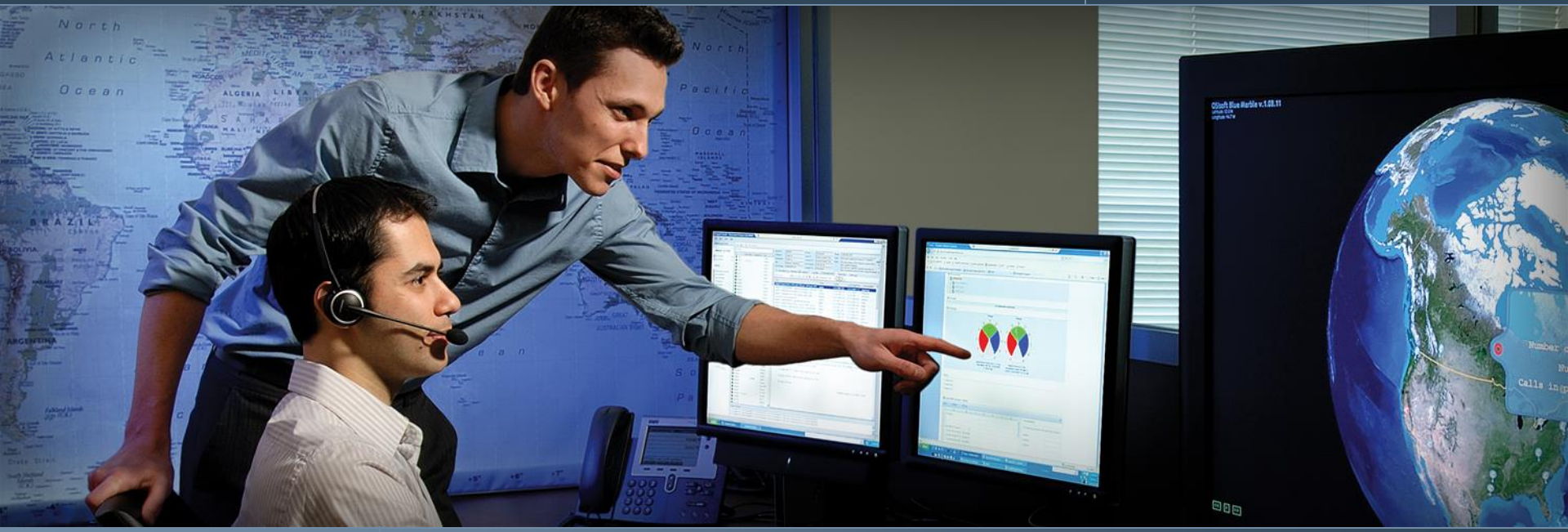
Regional Seminar Series



Customizations for Batch Traceability and Alarm Notifications

Dr. Michele Albicocchi, Solvay Chimica Italia

03-Feb-2010

Empowering Business in Real Time.

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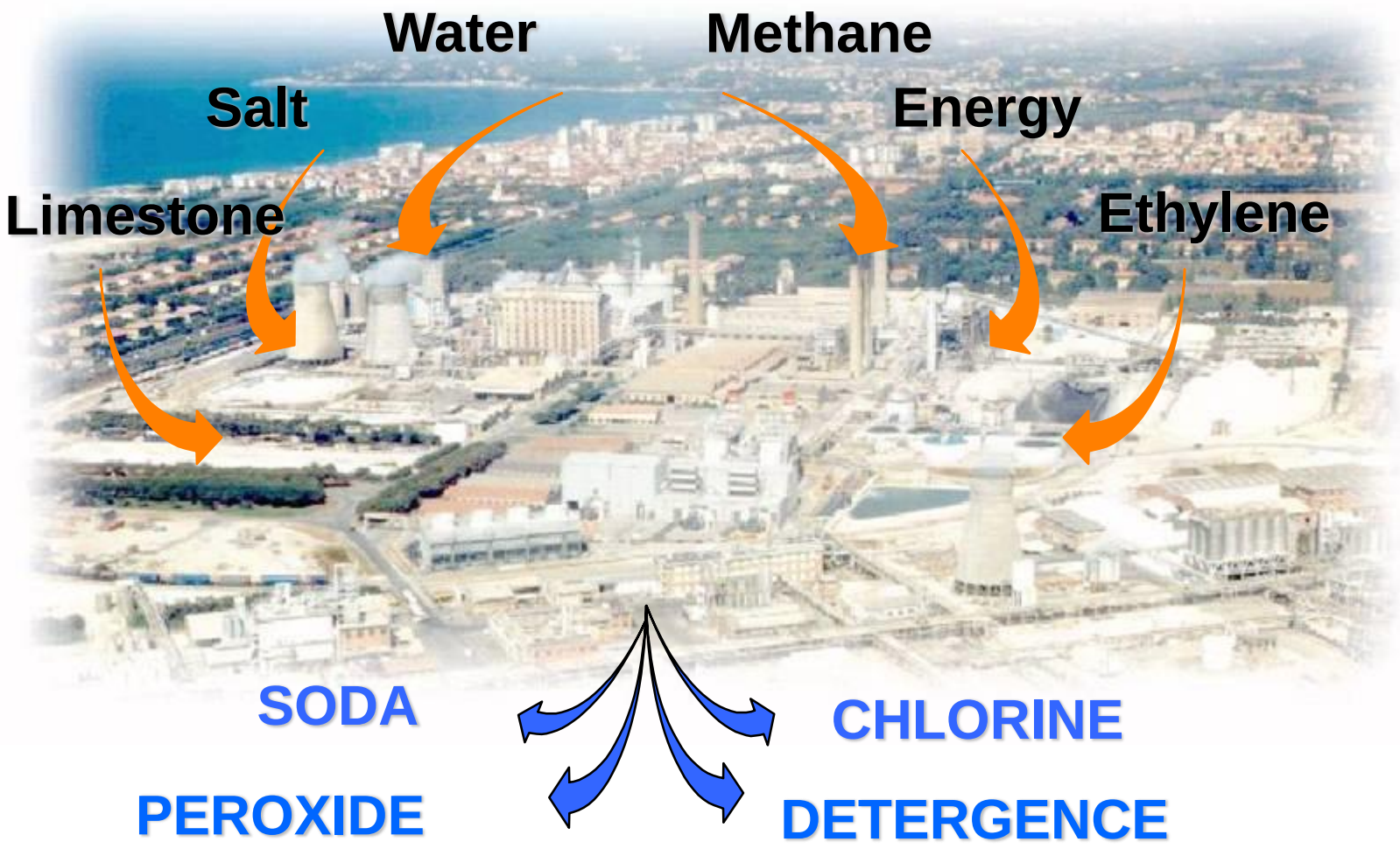
Solvay Factory in Rosignano



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Presentation Index

Batch Traceability (2004-2005)

- Goal
- Needed data objects
- Traceability flow
- Solution description

Alarm Notifications (2004)

- Goal
- Basic concepts
- Solution description

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Batch Traceability - Actors

Sarralbe - France

PE/PP Plants and IT Service
(Project Owner)

(Formerly member of Solvay Group)

Torino - Italy

(Solution Developer with PI & RLINK)

Rosignano - Italy

UST- Technical Service
(PI Expertise & Specs)

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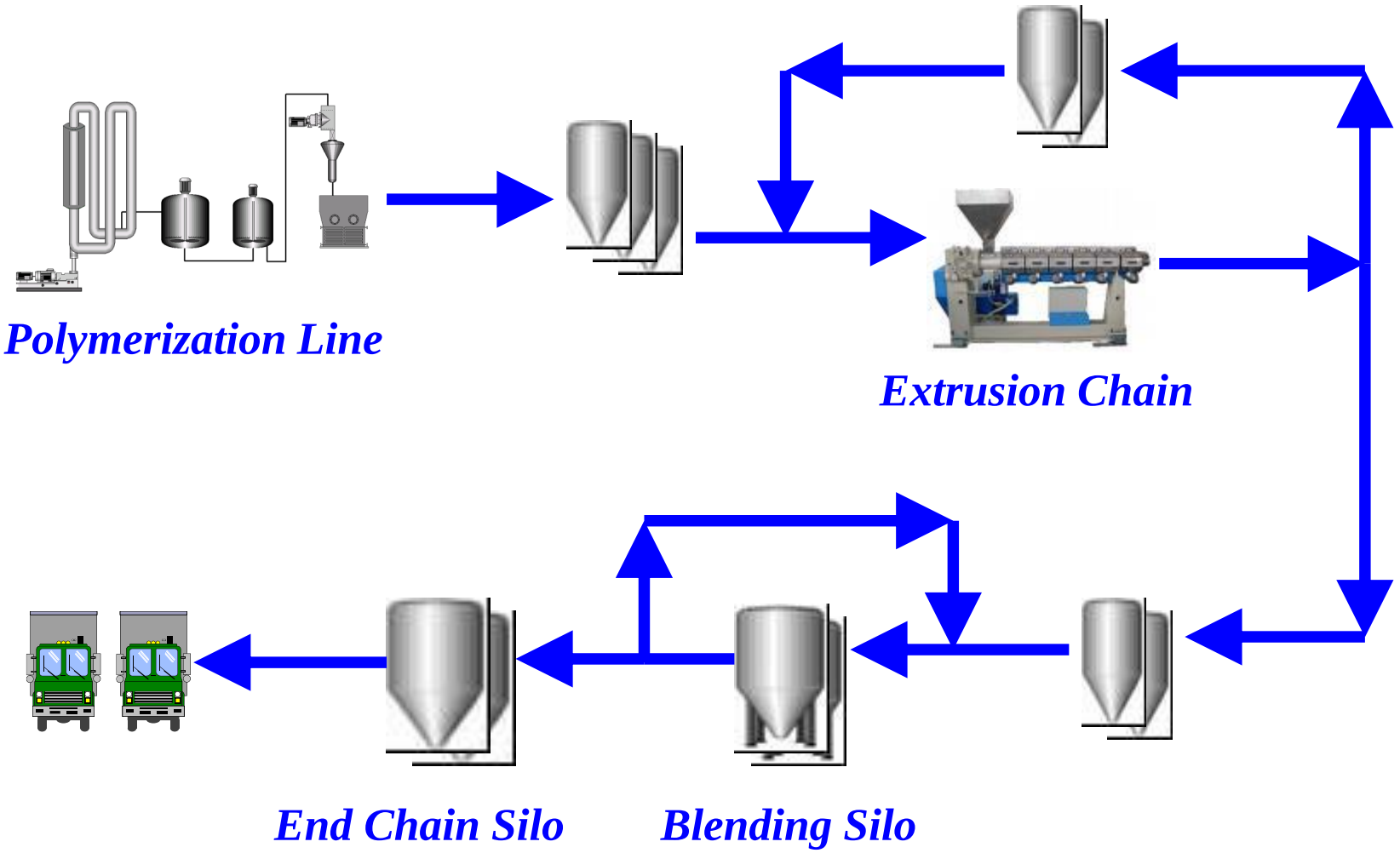
Batch Traceability – General Flow



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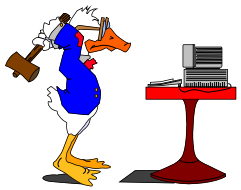
Batch Traceability – Achievements



Replacement of an old Laboratory system

(manual data update, high costs - ROI over 100% in a few years)

DCS Connection

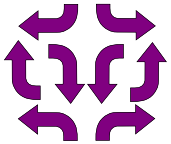
(real time upgrading, checks on product compatibility, etc.)

Process Management

(real time production control and material movement)

Treatment of Quality Parameters

(automatic calculation on batch closure, results to SAP)



Upward and Downward Traceability

(complaint management, problem delimitation, etc.)

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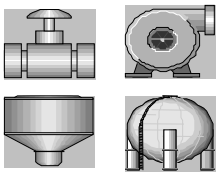
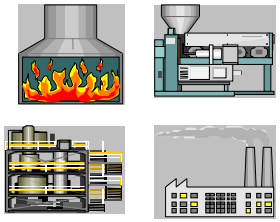
Batch Traceability – Data Objects

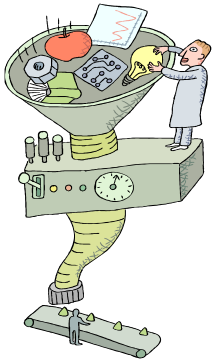
Batch: a Batch of any material made.



Element: any piece of Equipment within the Plant.



Unit: an Element used for process activities and production.



UnitBatch: a phase of production process inside a Unit, executed to make material.

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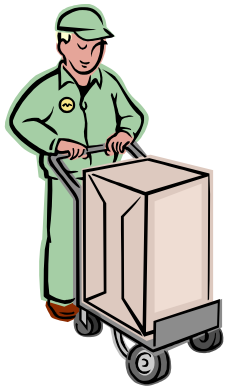
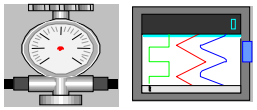
Batch Traceability – Data Objects



Transfer Record: an instance of material transfer. Source and Destination are Plant Elements or UnitBatches.



Tag : standard component representing a measurement revealing data along the time.

Property : object characteristic (unique value).

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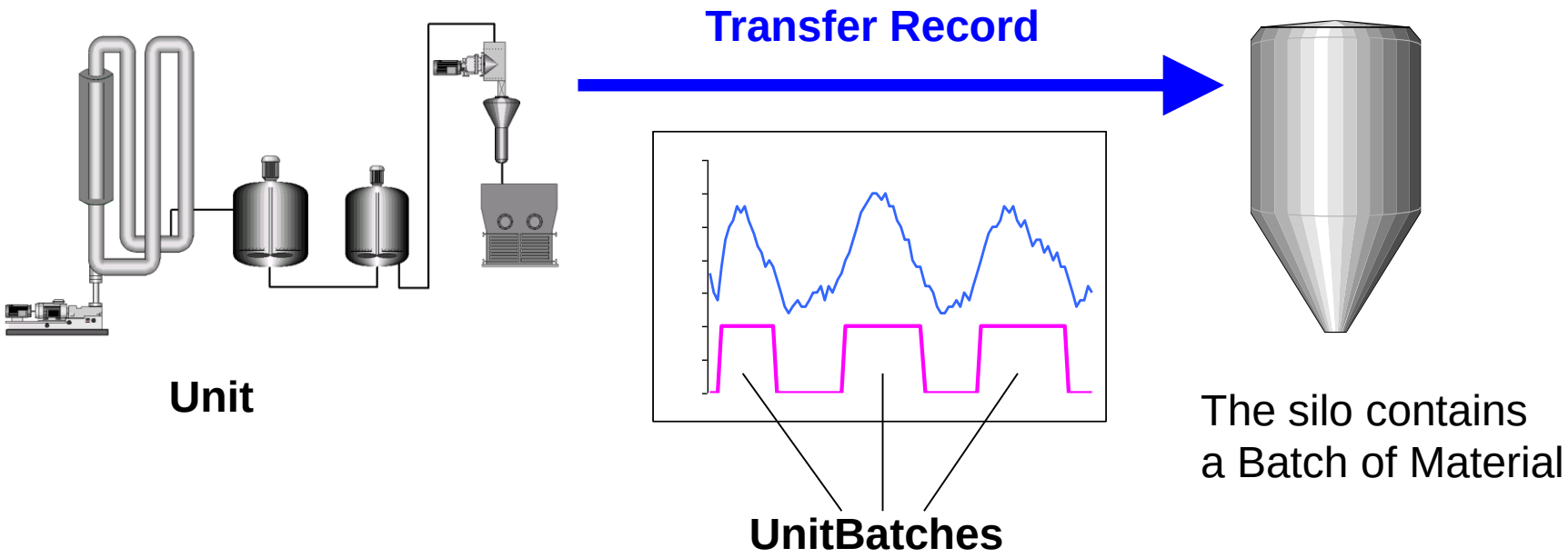
Data Objects in our context

A Polymerization Line produces a Batch of Material at different time periods.

A Unit produces a Batch at different UnitBatches



A UnitBatch is always related to a Unit.

A Unit can have only one UnitBatch running at a time.

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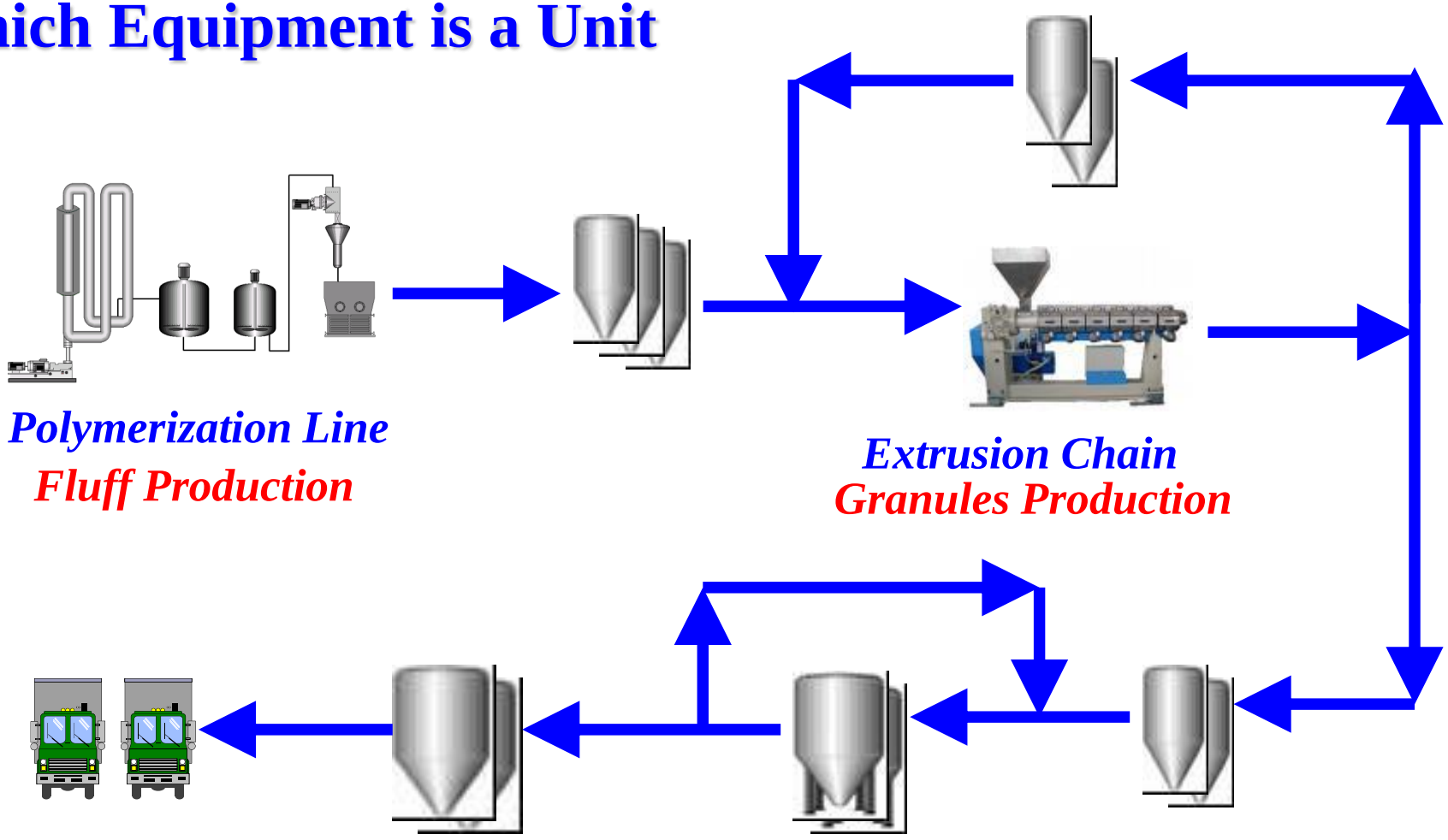
Which Equipment is a Unit



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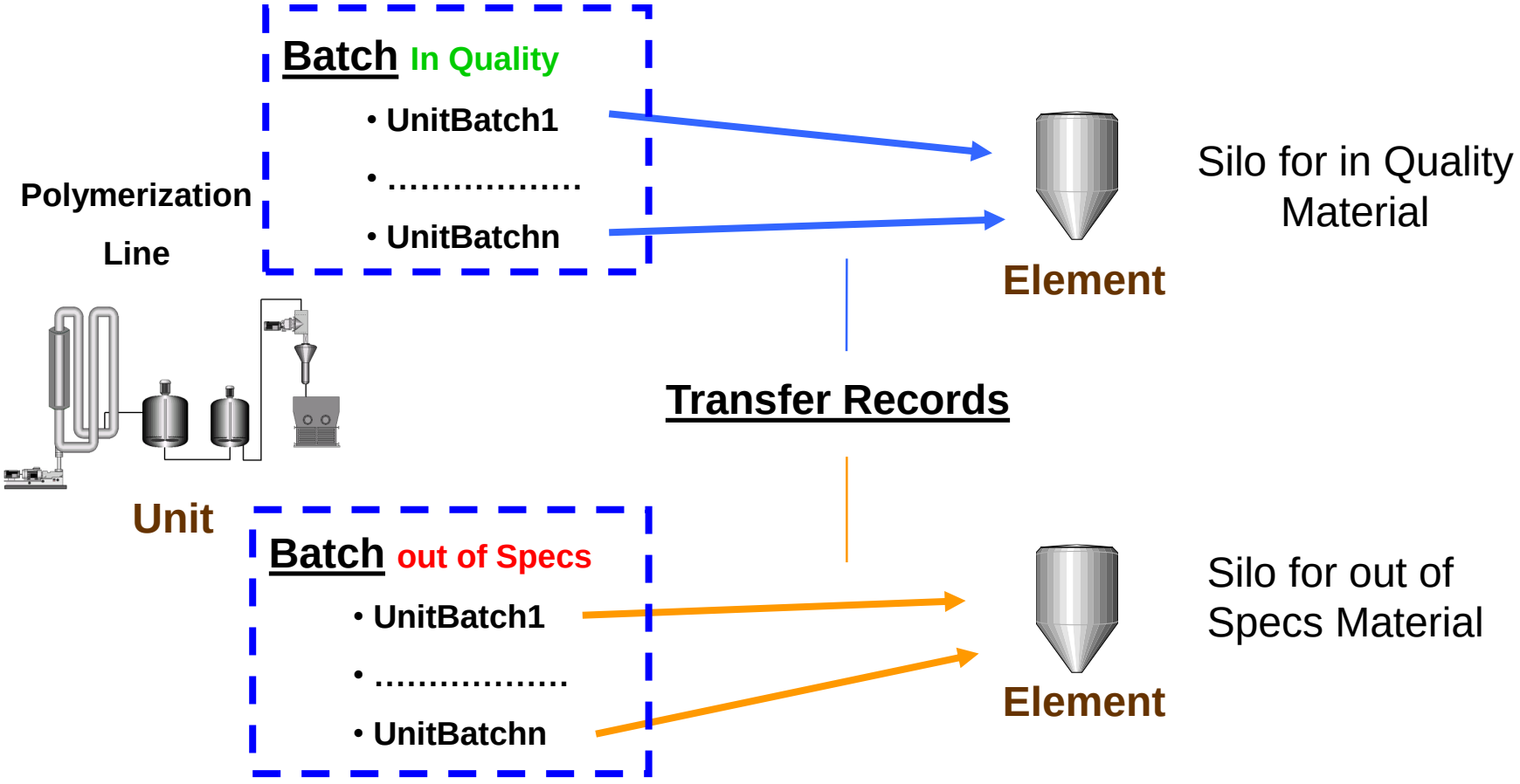
Track Flow: Polymerization line → Silo



A Batch is produced during one or more UnitBatches. A UnitBatch belongs to only one Batch. During each production period there is a batch transfer from the polymerization line to the destination silo.

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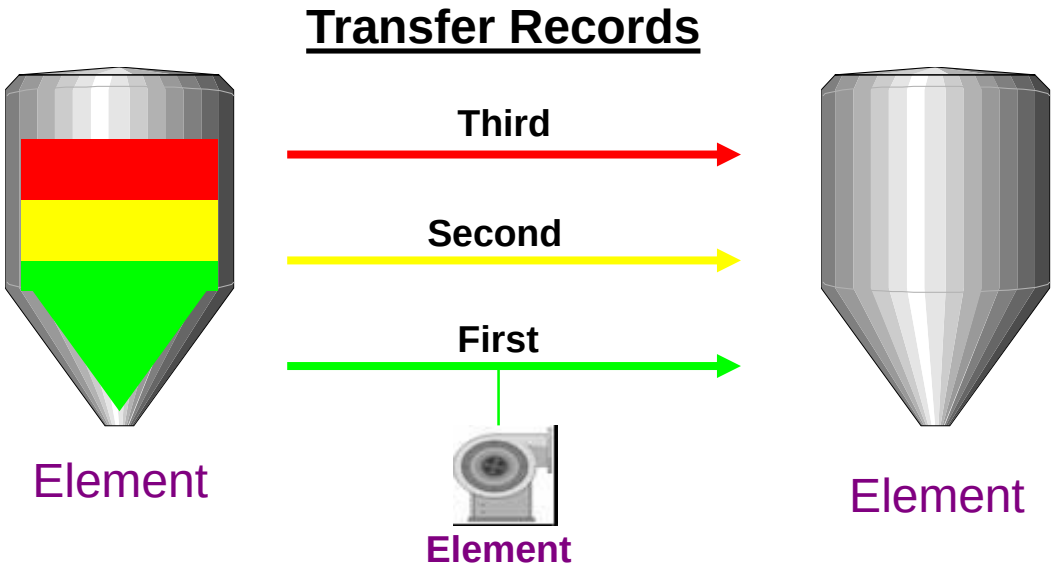
Track Flow: Silo → Silo



- Material transfer activated by the Air Compressor
- One Transfer Record per each material Batch transferred
- A Transfer Record contains parameters such as Batch name, quantity, etc.
- A silo can be the source or destination of several transports at the same time
- We assume Material is transferred into FIFO (first in first out) mode.

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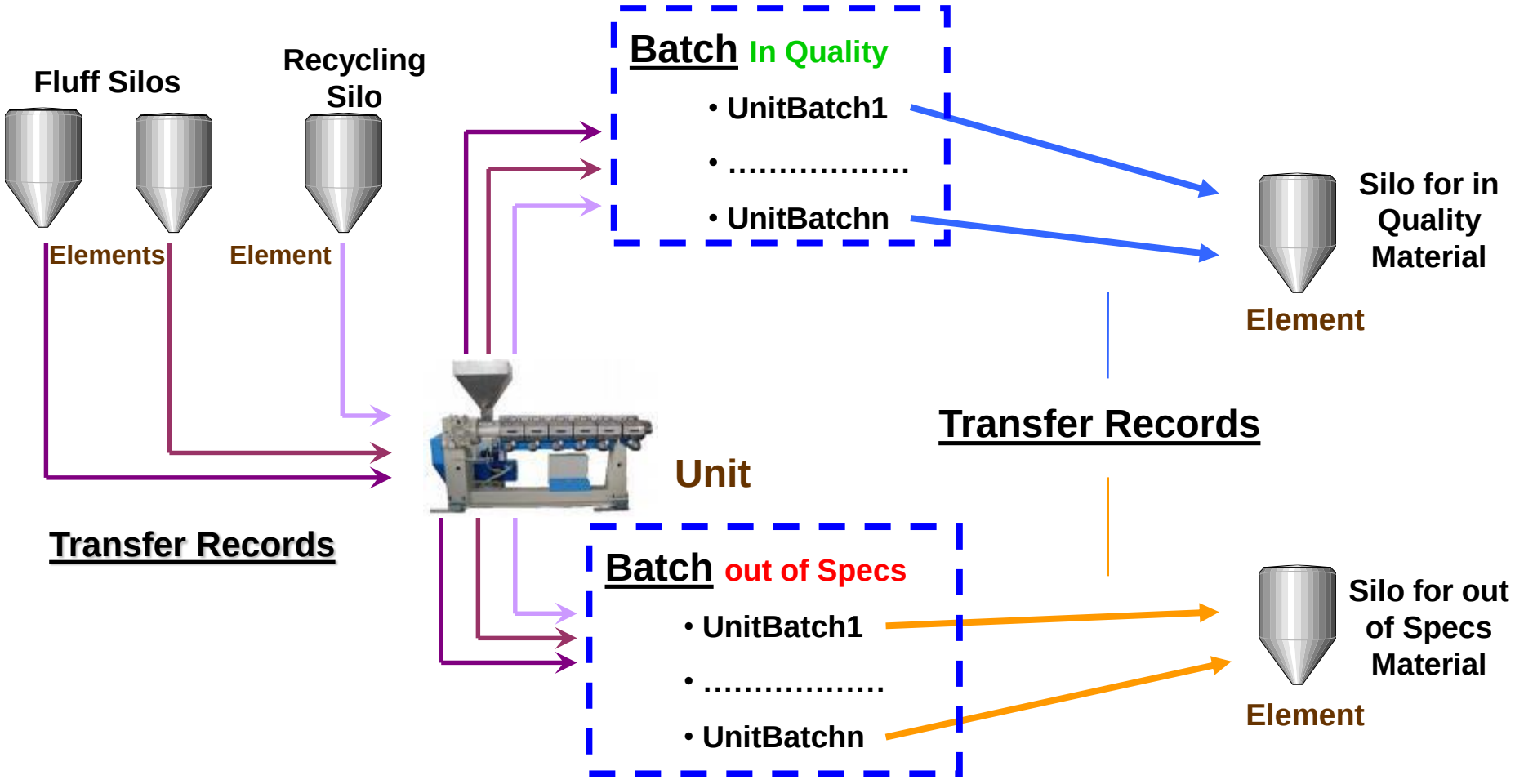
Track Flow: Silo → Extruder → Silo



During each production phase (UnitBatch), at least two Fluff and one Recycling Batches are used to produce the Granule Batch sent from the Extruder to the destination Silo. All this Info is stored in the Transfer records.

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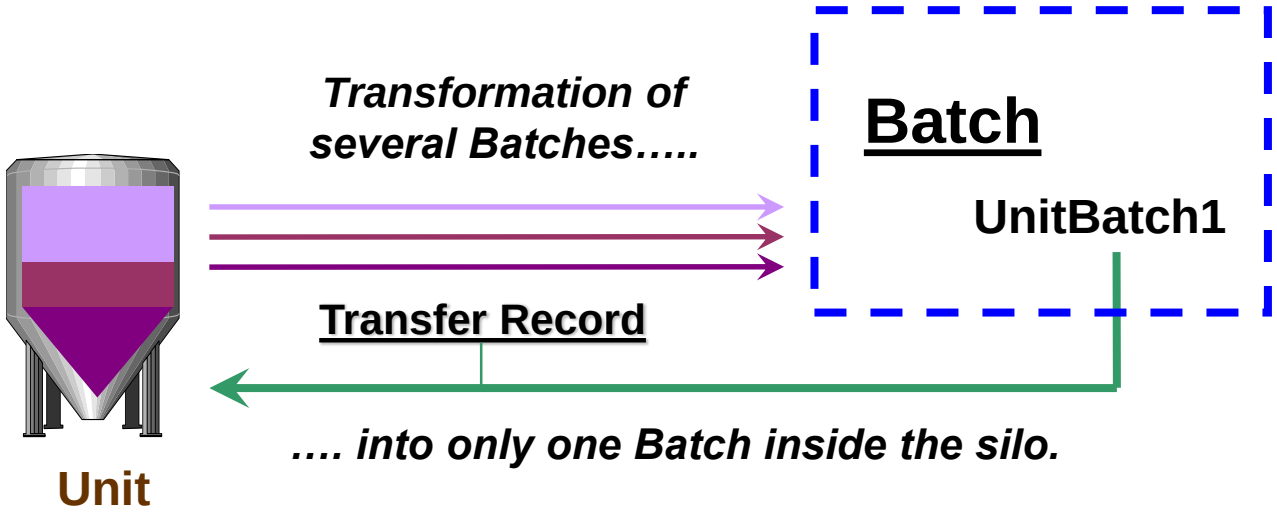
Track Flow: Technical Batch



- A Batch is generated as a result of the blending operation.
- This Batch has a unique UnitBatch as its transformation process.
- Only one Transfer Record from the blending silo to itself. Input Batches are all those initially contained. Output Batch is the produced one.

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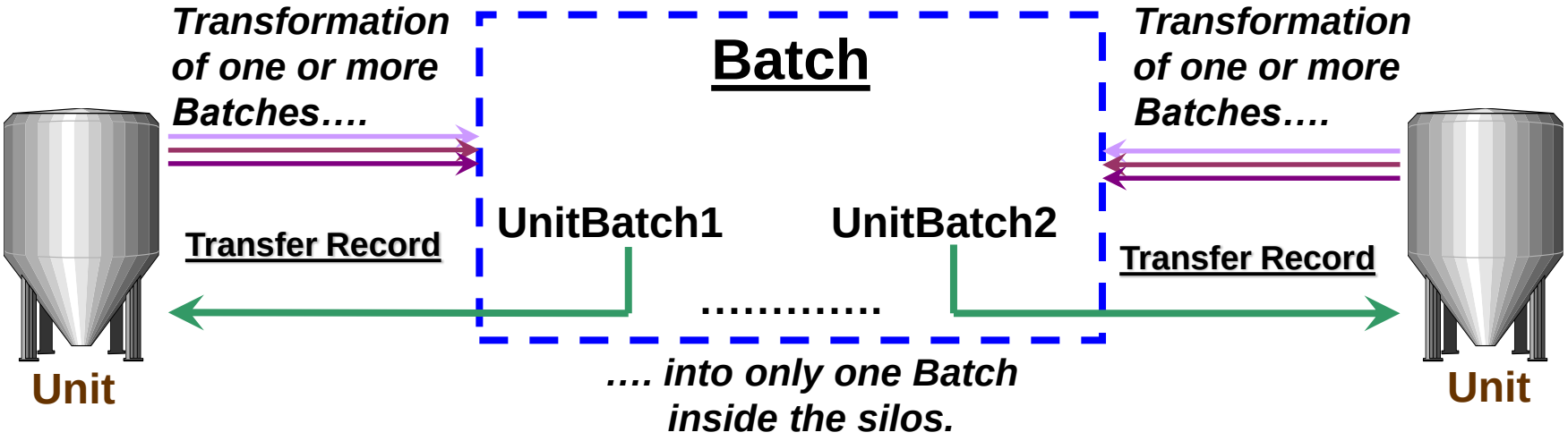
Track Flow: Commercial Batch



- All materials contained in one or more silos (two in the above example) are declared to be the same Batch of material.
- A transformation process per silo is operated: all Batches (Batches) inside a silo are transformed into the commercial one.
- The Commercial Batch (Batch) groups all transformation processes (UnitBatches).
- There is a Transfer Record for each silo, moving material inside the silo. Input: Batches initially dwelling. Output: Commercial Batch.

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Batch Traceability: Possible Solutions

Two possible solutions were examined; usage of

1) PI Batch Data Base 2) PI Analysis Framework

Data Object	PI Batch DB	PI - AF
Batch	PIBatch	
Unit	PIUnit	AF Element
UnitBatch	PIUnitBatch	
Element	PI Module	AF Element
Transfer Record	PITransferRecord	AF Transfer
Tag	MDB Alias	AF Attribute
Property	MDB Property	AF Attribute

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Batch Traceability: Solutions with PI Batch Data Base

PRO:

- Only PI Batch Server Application is needed
- Less PI License Costs (points and software)

CON:

- PITransferRecords: indexes (only time) and name (not set)
- Performance doubts (real time update and management)
- More Programming and Configuration Costs

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Batch Traceability: Solutions with Analysis Framework

PRO:

- Easier Configuration
- Less Programming Costs
- Commitment on Performances

CON:

- More PI License Costs
- PI – AF recently released (year 2004)

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Batch Traceability: chosen Solution

Choice: **Solution with PI-AF due to performances and programming costs.**

Data Object	PI Batch DB	PI - AF
Batch	PIBatch	
Unit	PIUnit	AF Element
UnitBatch (opt.)	PIUnitBatch	
Element	PI Module	AF Element
Transfer Record	PITransferRecord	AF Transfer
Tag	MDB Alias	AF Attribute
Property	MDB Property	AF Attribute

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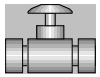
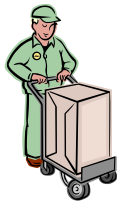
Batch Traceability: Data Objects in our Solution

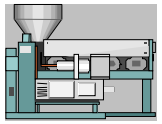
PIBatch: Batch of produced material, from polym.line, extruder, blending, commercial batch declaration.



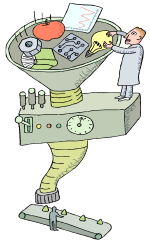
AF Element: any piece of Equip. concerning the Plant, including the ones producing batches.



AF Transfer: record of Batch transfer from one Element to another.



PIUnit (optional): piece of Equipment where a Batch is generated (polym.line, extruder, blend.silo…).



PIUnitBatch (optional): process executed to produce a Batch, like polymerization, extrusion, blending, commercial lot declaration.

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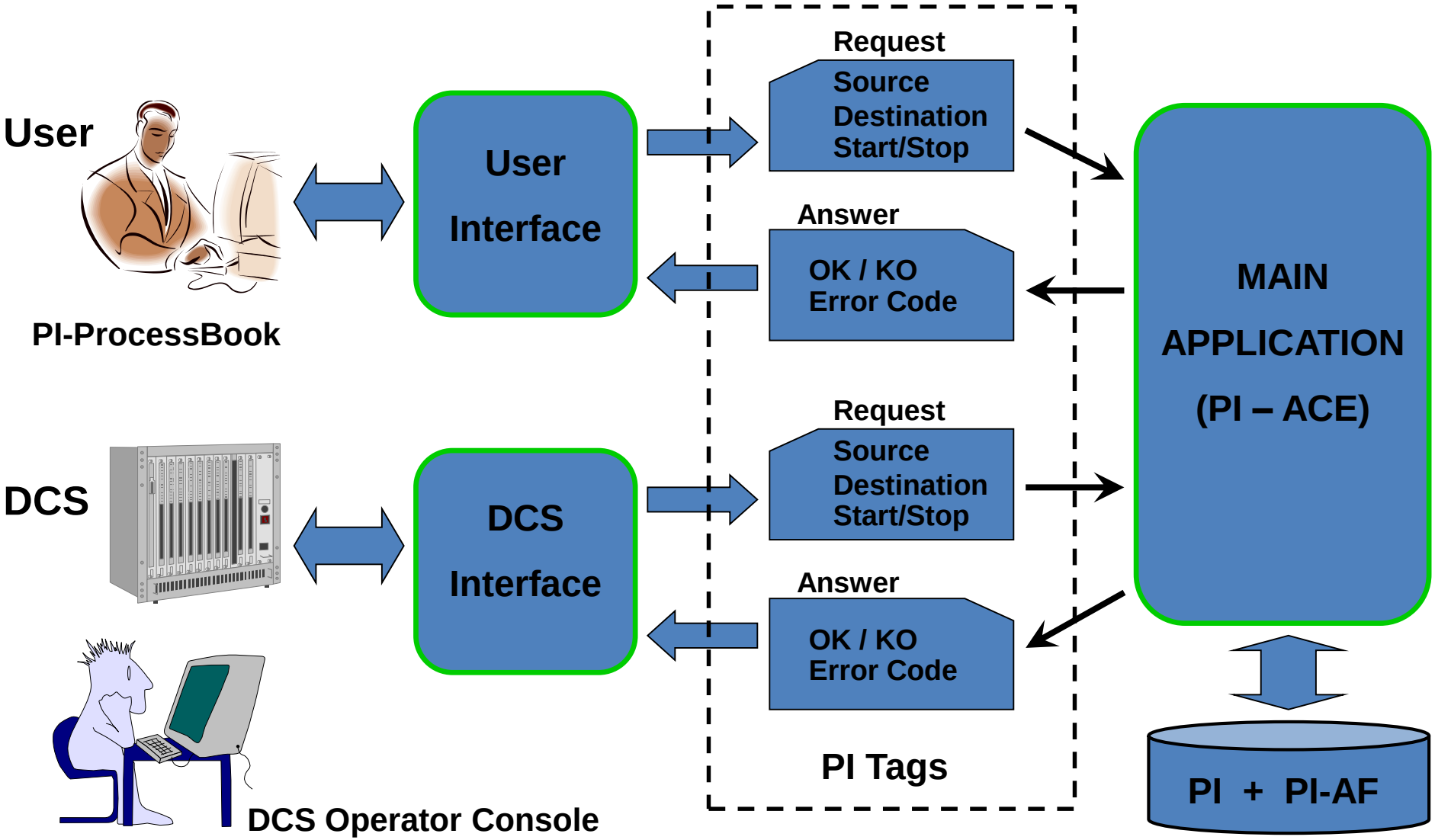
Batch Traceability: Architecture of our Solution



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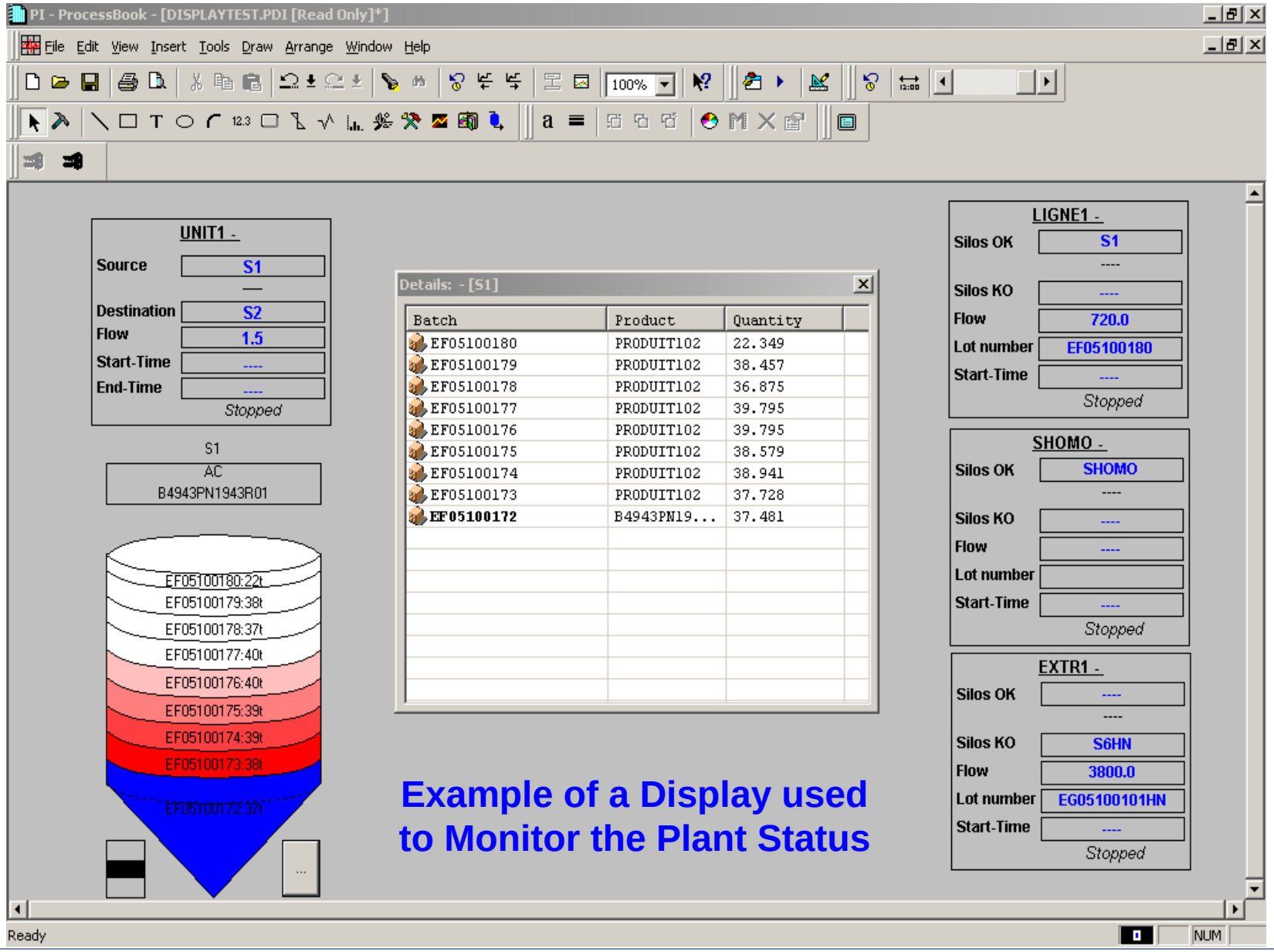
Customizations for Batch Traceability and Alarm Notifications



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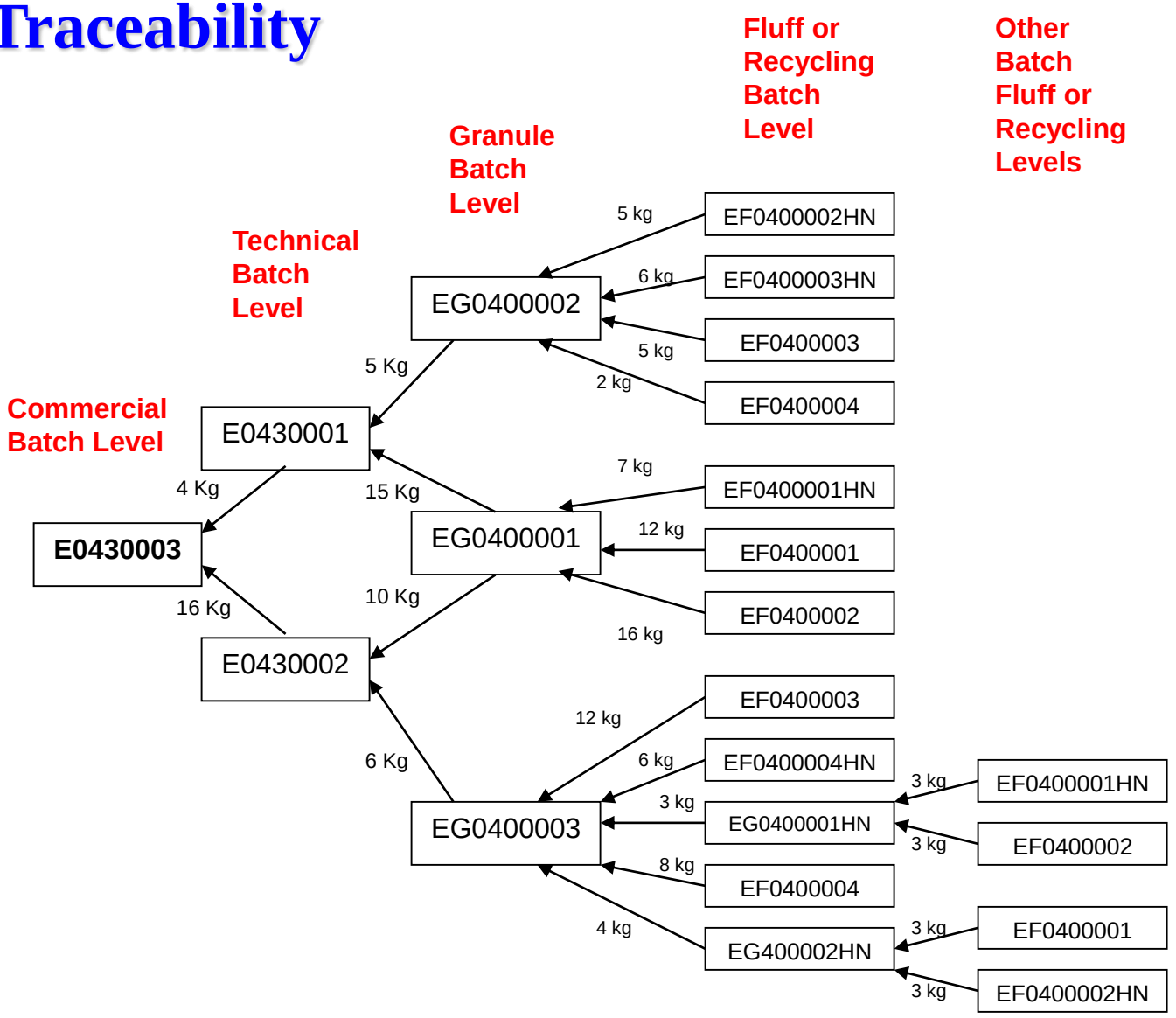
Upward Traceability



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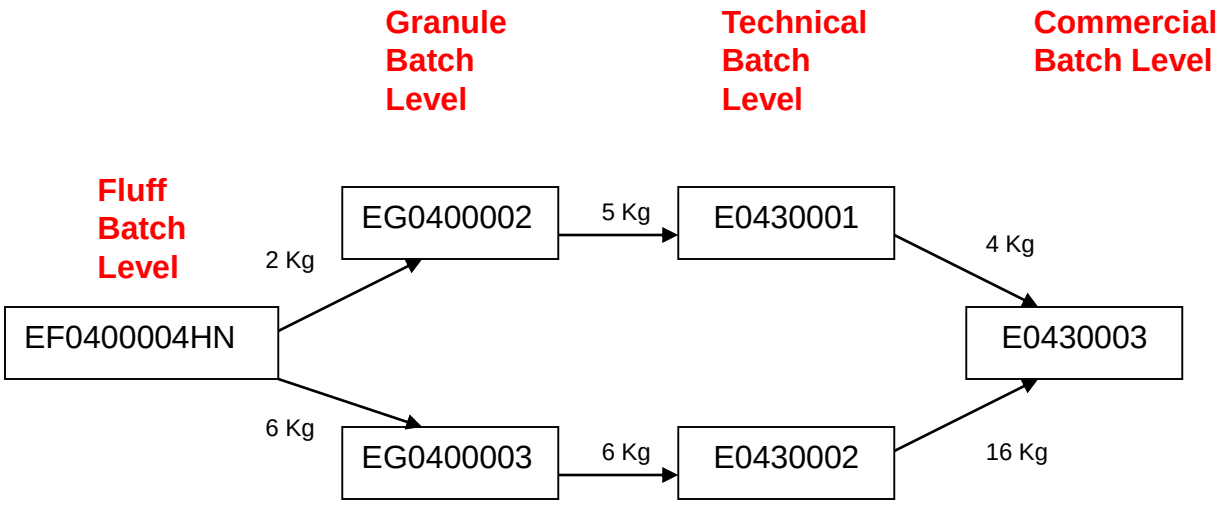
Downward Traceability



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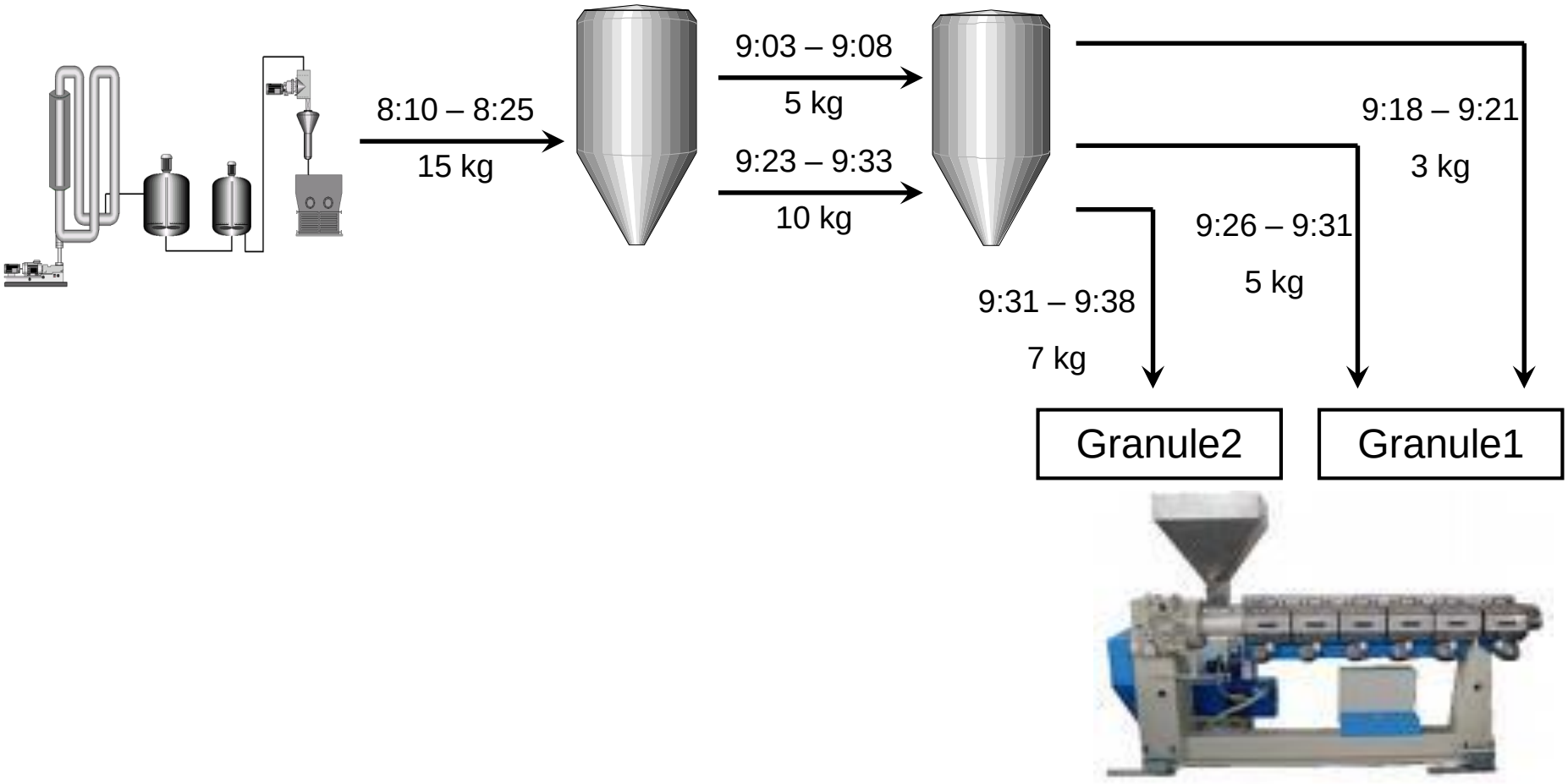
Find the Equipment where fluff Batch "XYZ" was



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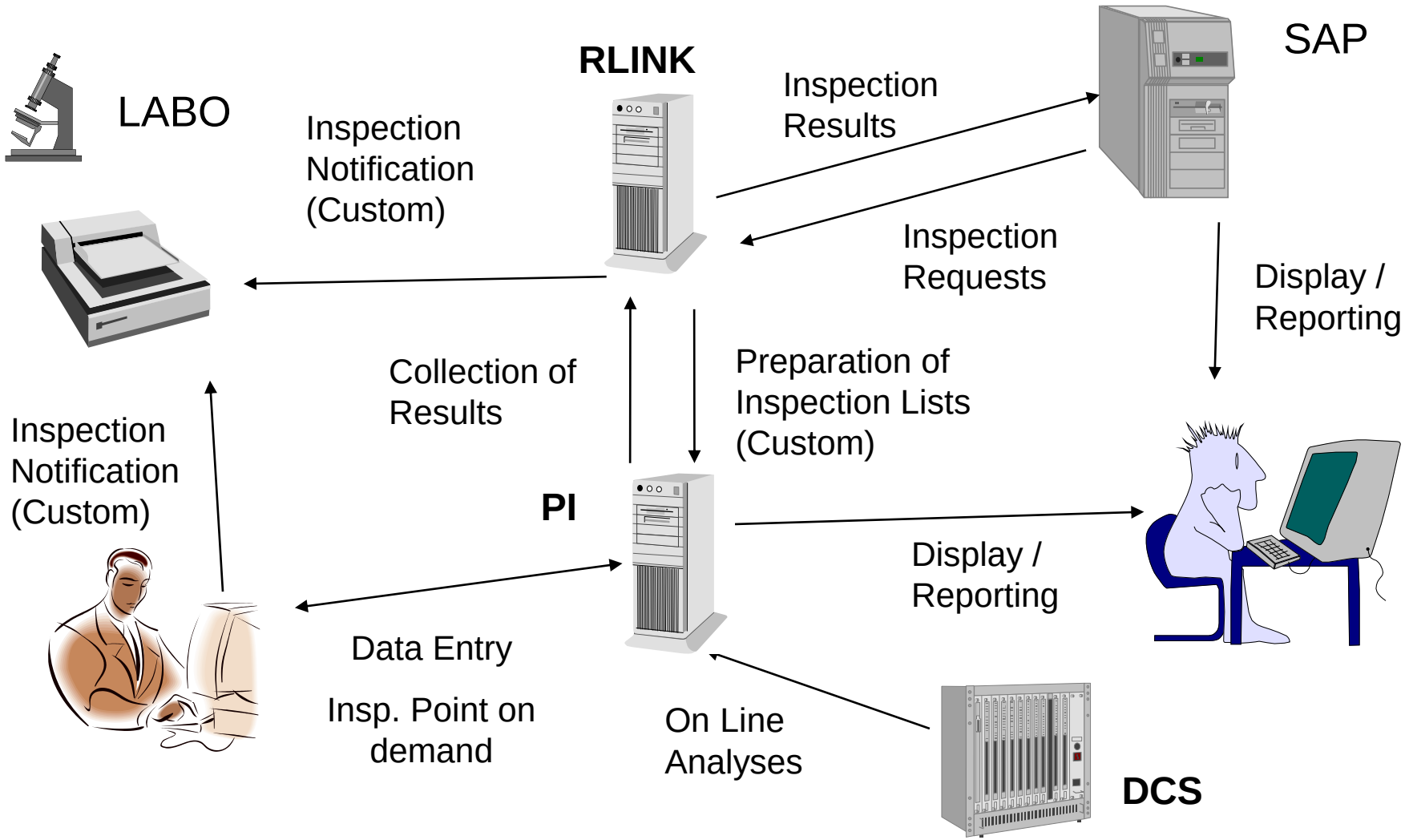
RLINK – SAP/QM



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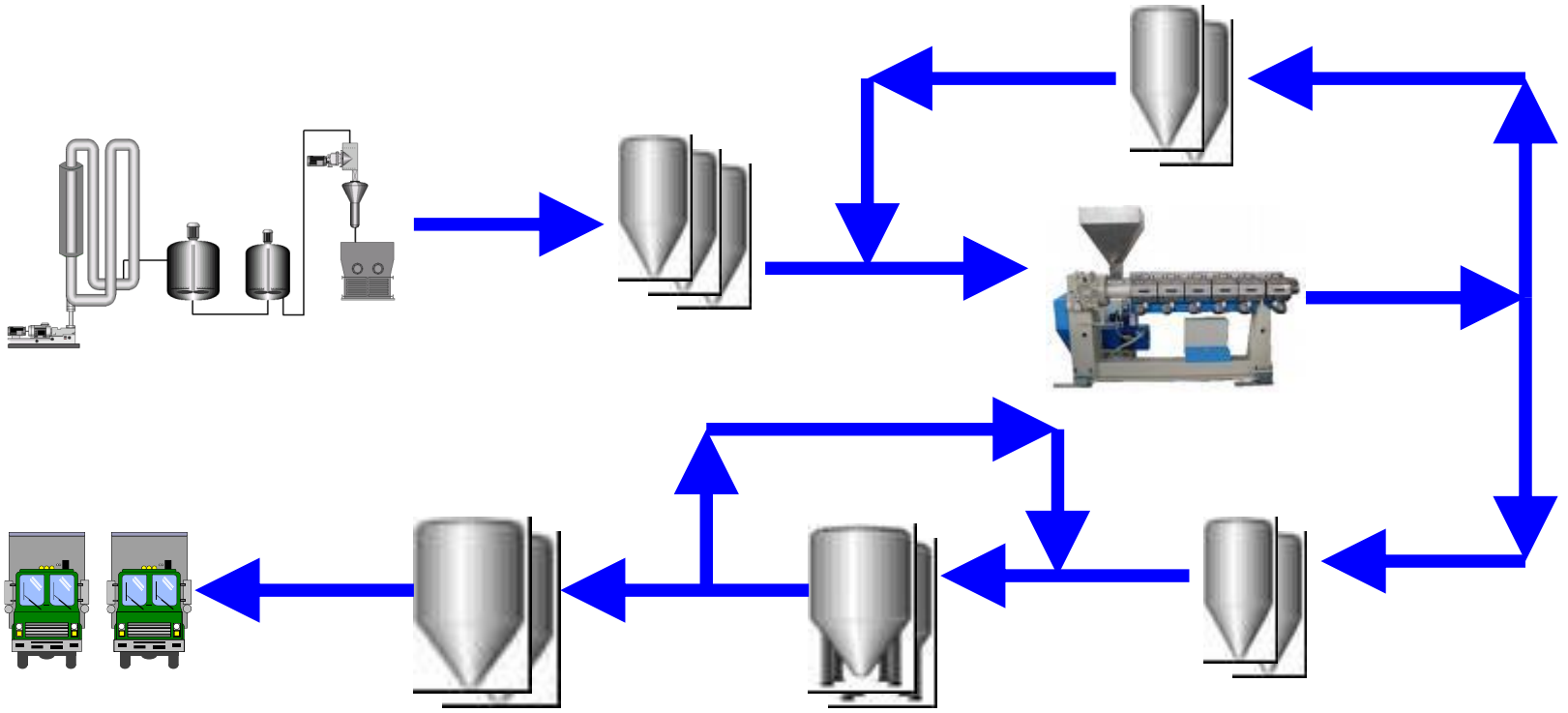
Expected results from Batch Traceability



Complaints Management

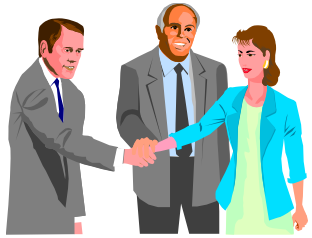
+

Control, Doc, Analysis, …

+

Conduction Help

=



Satisfaction

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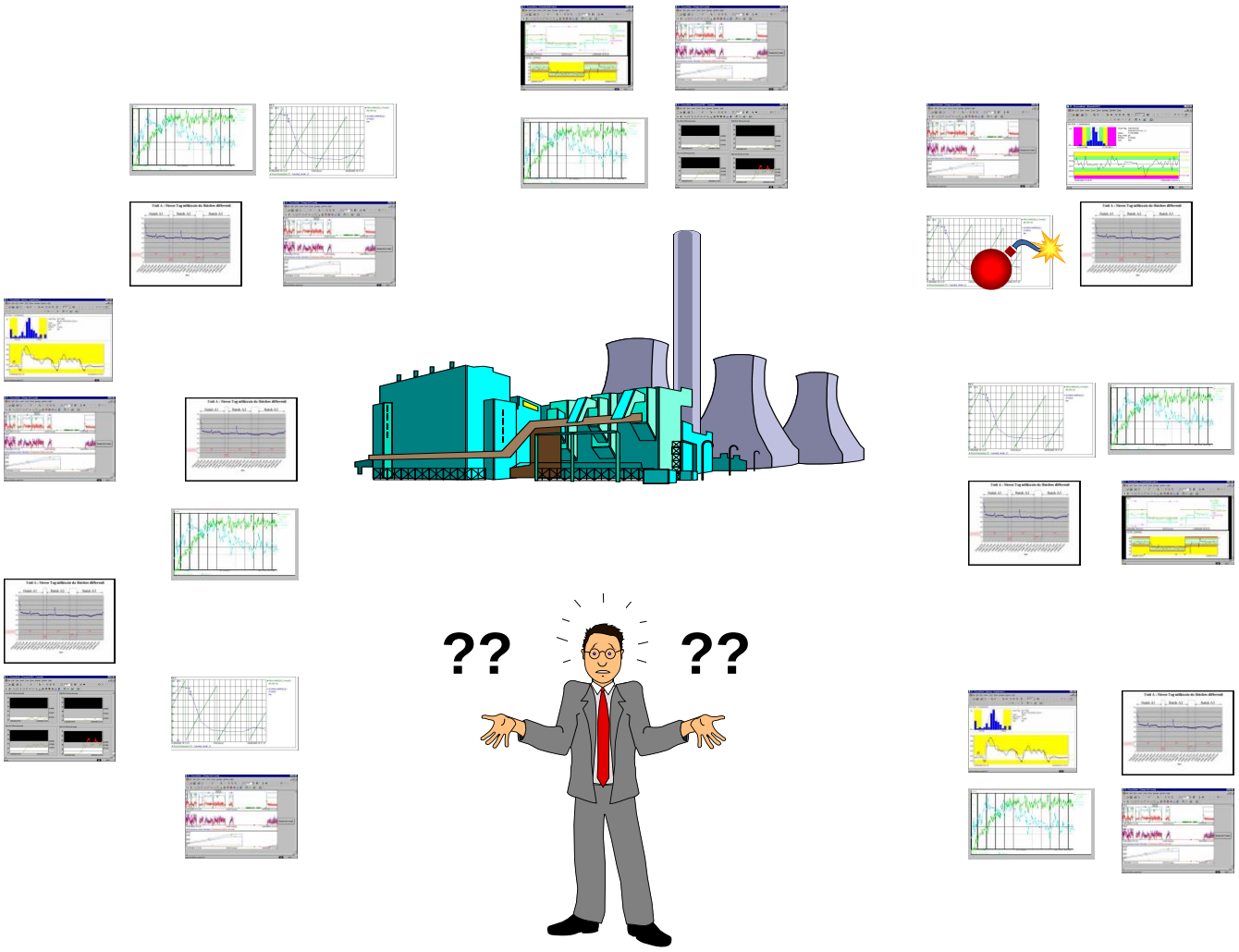
Alarms Notifications: Why ?



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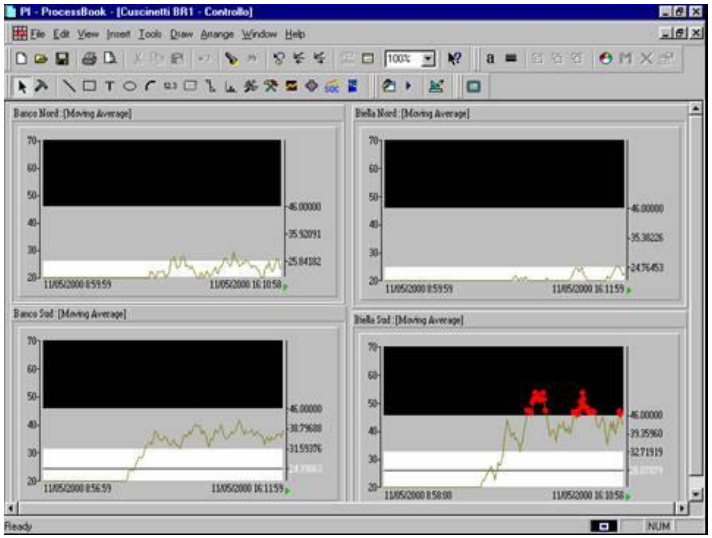
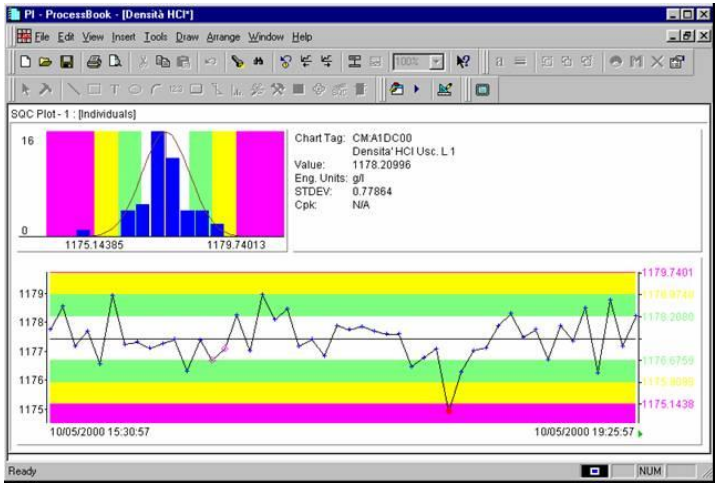
What kind of Alarms ?



"**Measurement Alarms**": tag values are checked against a threshold or status.



"**SQC Alarms**": a sequence of tag values are evaluated to verify if a particular SQC alarm status is happening.

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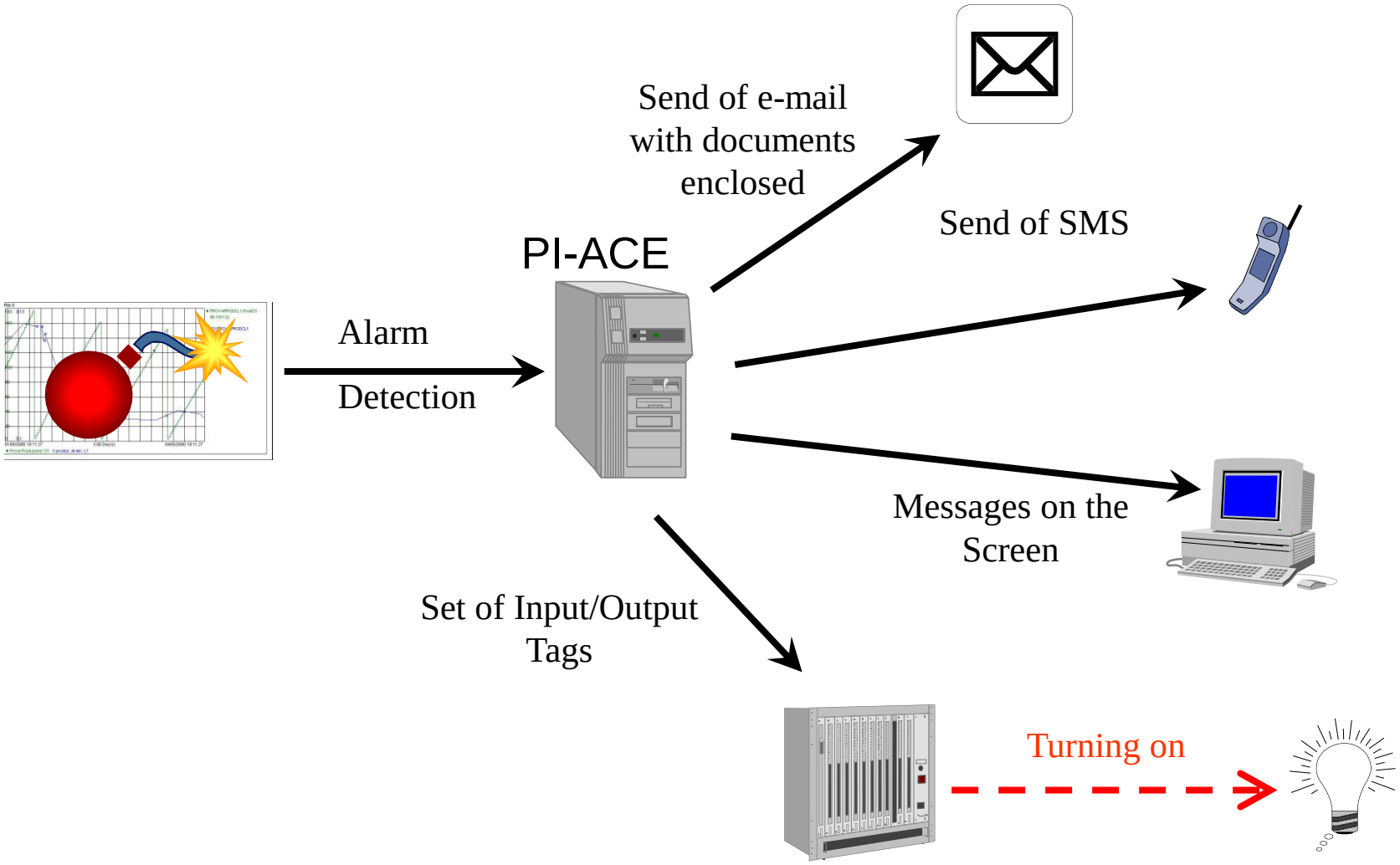
Notification means



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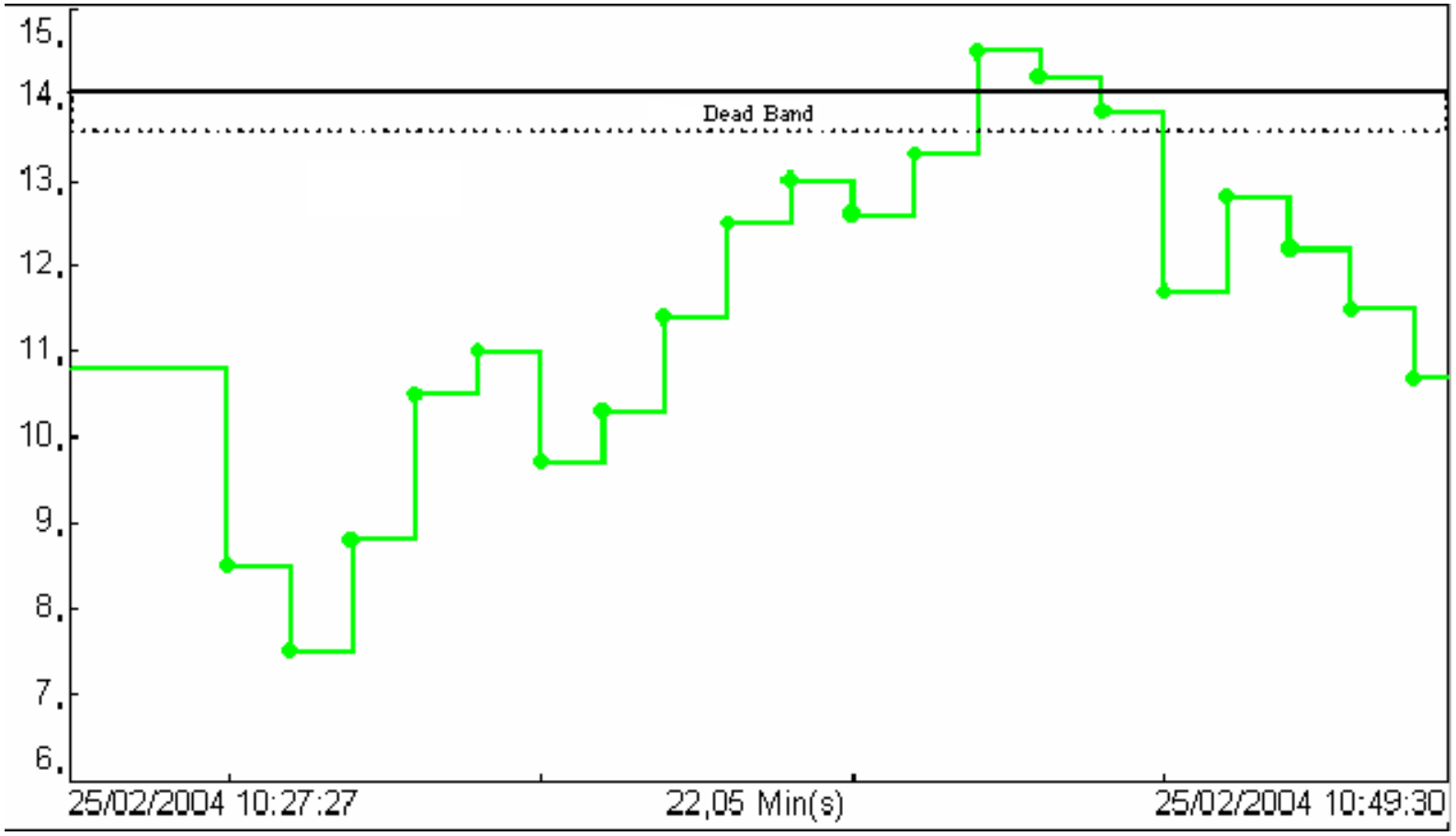
Measurement Alarms: Basic Concepts

Step over the Threshold



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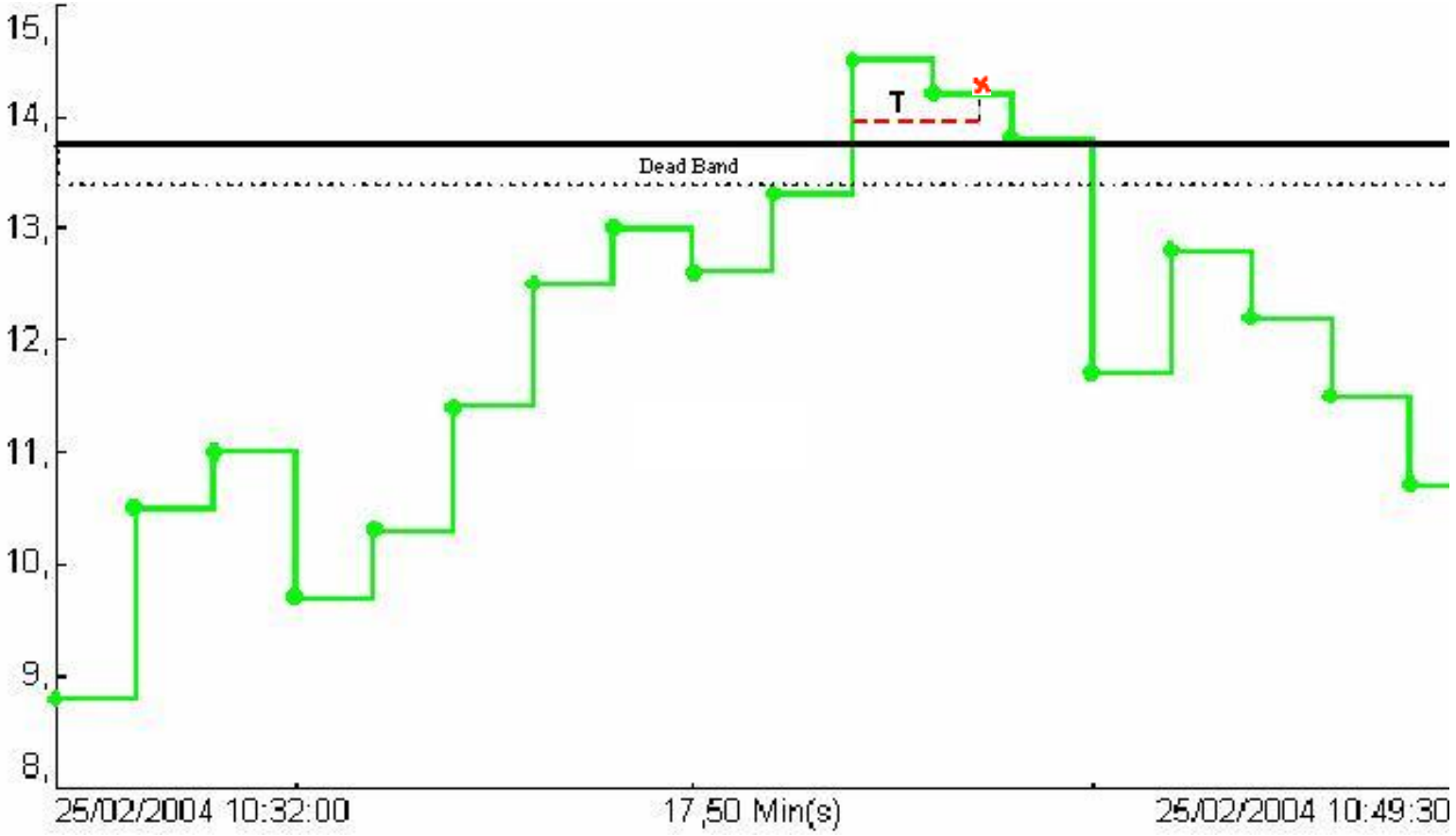
Measurement Alarms: Basic Concepts

Step over the Threshold with Filter Time



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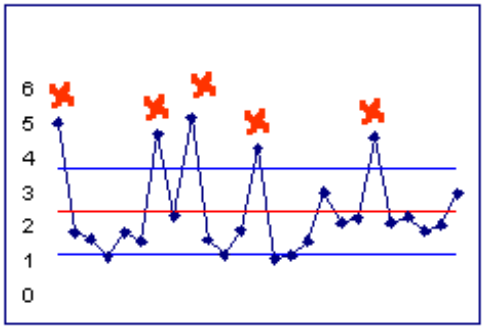
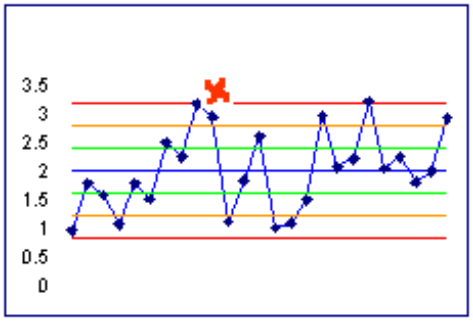
Statistical Alarms: Basic Concepts

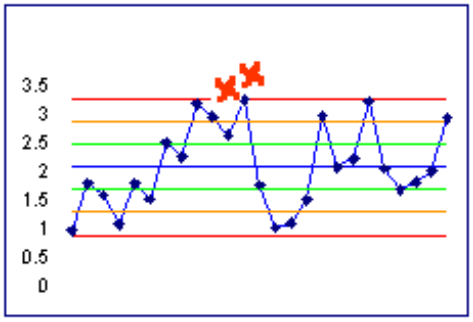
Instability



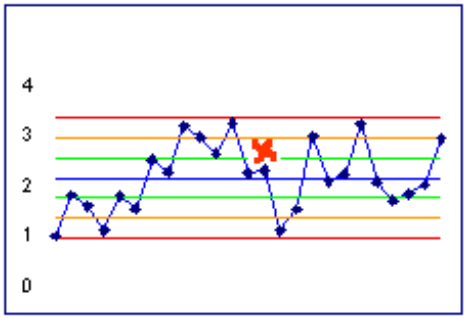
1 point outside 3σ



2 out of 3 points beyond 2σ



4 out of 5 points beyond σ



8 successive points on one side of the CL

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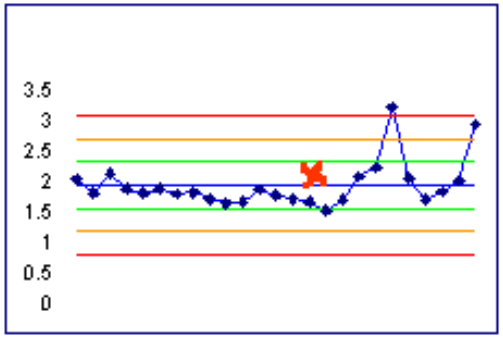
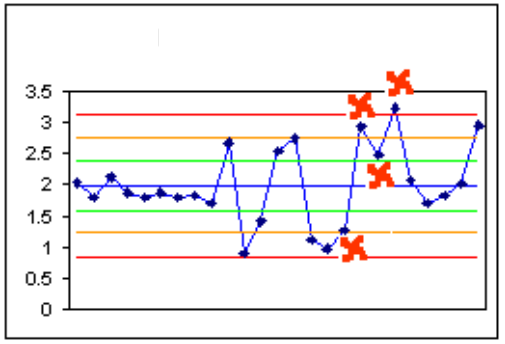
Statistical Alarms: Basic Concepts

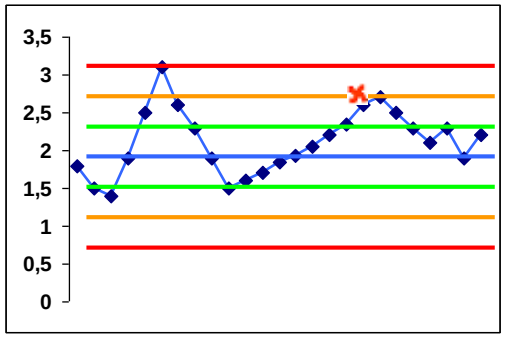
Other Tests



Stratification



Mixtures



Trend

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Statistical Alarms: Basic Concepts

Alarm Tag

- *It takes an alarm status according to Values/States of another Tag*
- *Are hierarchically grouped (Site/Area/Plant…)*
- *They can use time filters (alarm triggered after condition persistence)*
- *Possible States: Lolo, Low, Normal, High, Hihi…*
- *Threshold Value can be determined by another Tag (Reference)*
- *For each alarm tag we must define at least another one (Source)*

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Statistical Alarms: Basic Concepts

SQC Tag

- *It is similar to an Alarm Tag with no Time Filter*
- *Possible States (in order of precedence):*

  OutsideControl, Outside2Sigma, Outside1Sigma, OneSideofCL,

  Stratification, Mixture, Trend, Normal
- *Tests are made on the single states of the Source Tag*
- *For each SQC Tag other 6 tags must be defined:*

  Source, Center Line, TestStatus, UCL, LCL, Reset
- *Other 4 additional Tags can be defined:*

  USL, LSL, Comment, Product

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Alarm Notifications: usable Tag Types

Tag Type	Usage of Source Tag(s)	Numeric	Digital
Process/Labo Tag		X	X
Calculated Tag	X	X	X
Alarm Tag	X		X
SQC Tag	X		X

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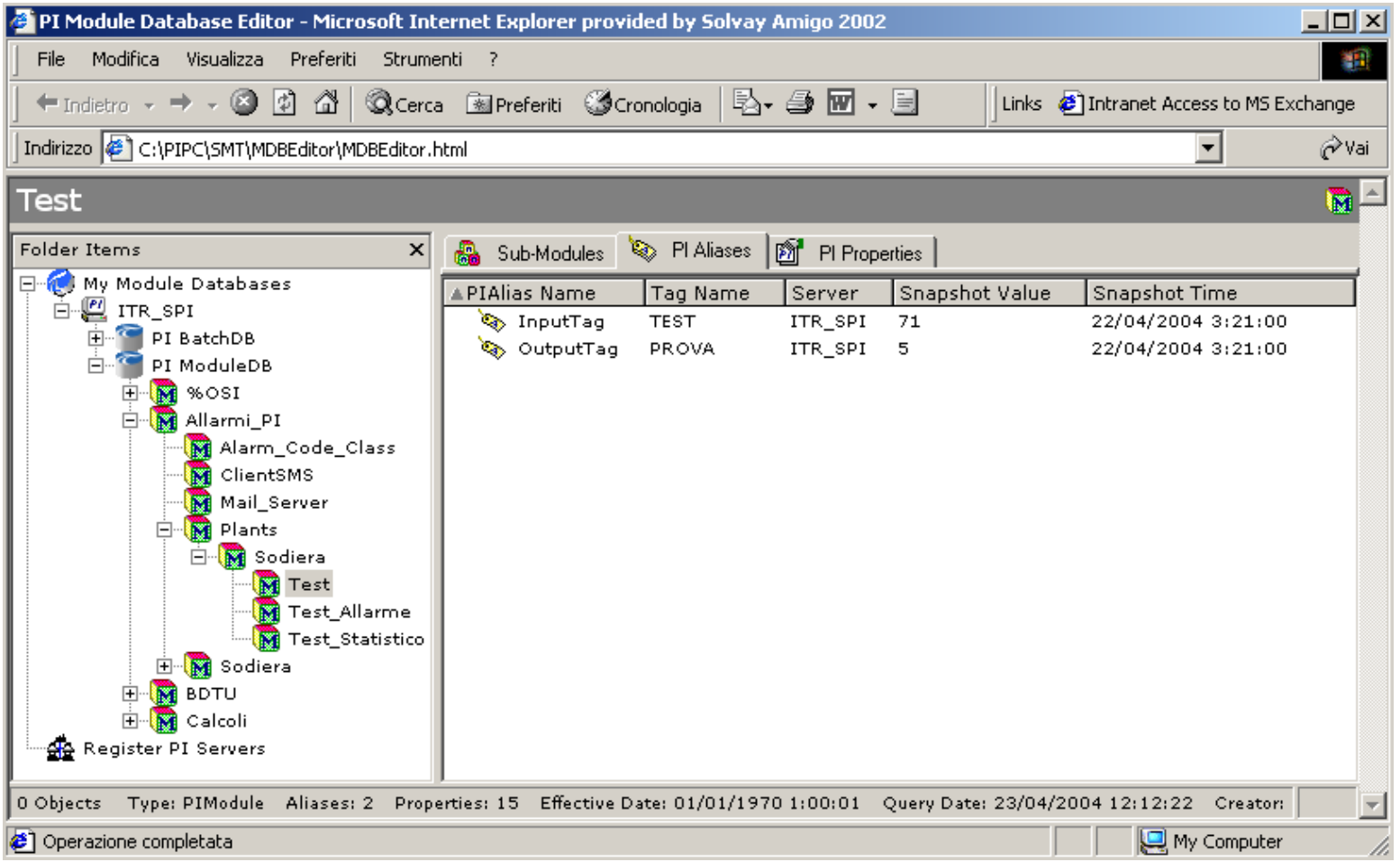
Alarm Notifications: PI Aliases configuration



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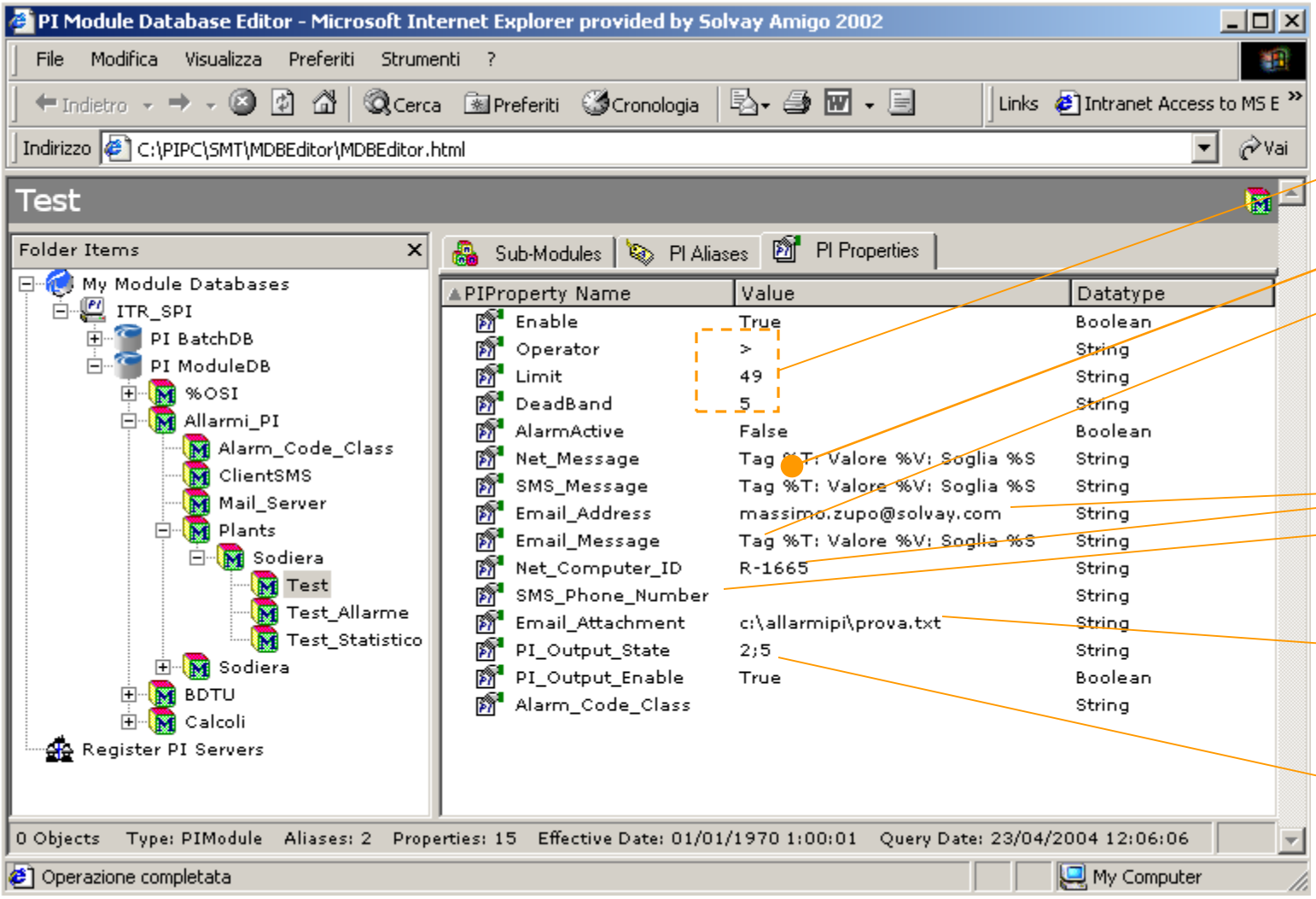
Alarm Notifications: configuration for a process/labo tag



Limit condition

Text Messages

Addressees

Enclosed document

Output tag values (False;True)

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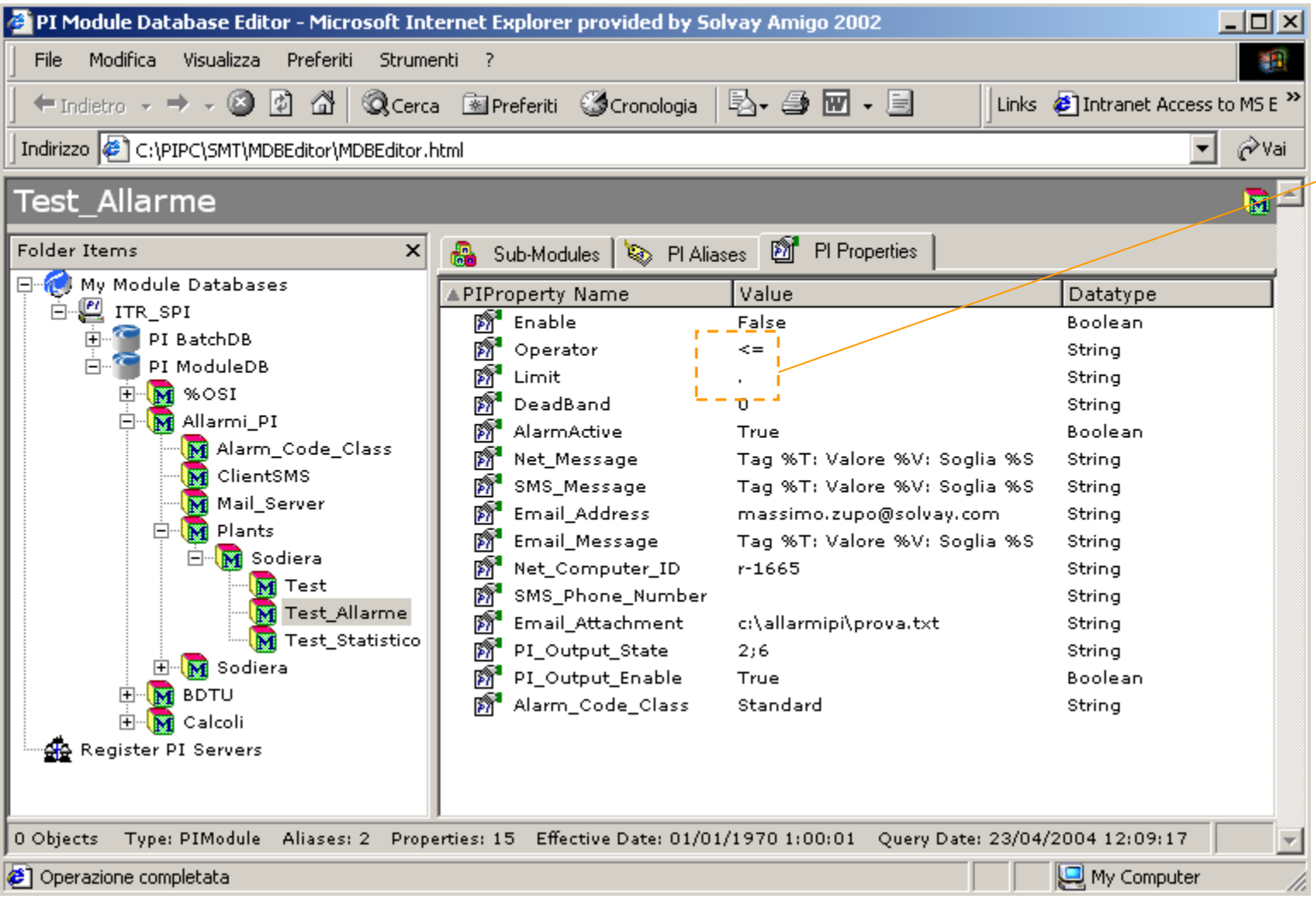
Alarm Notifications: configuration for an alarm tag



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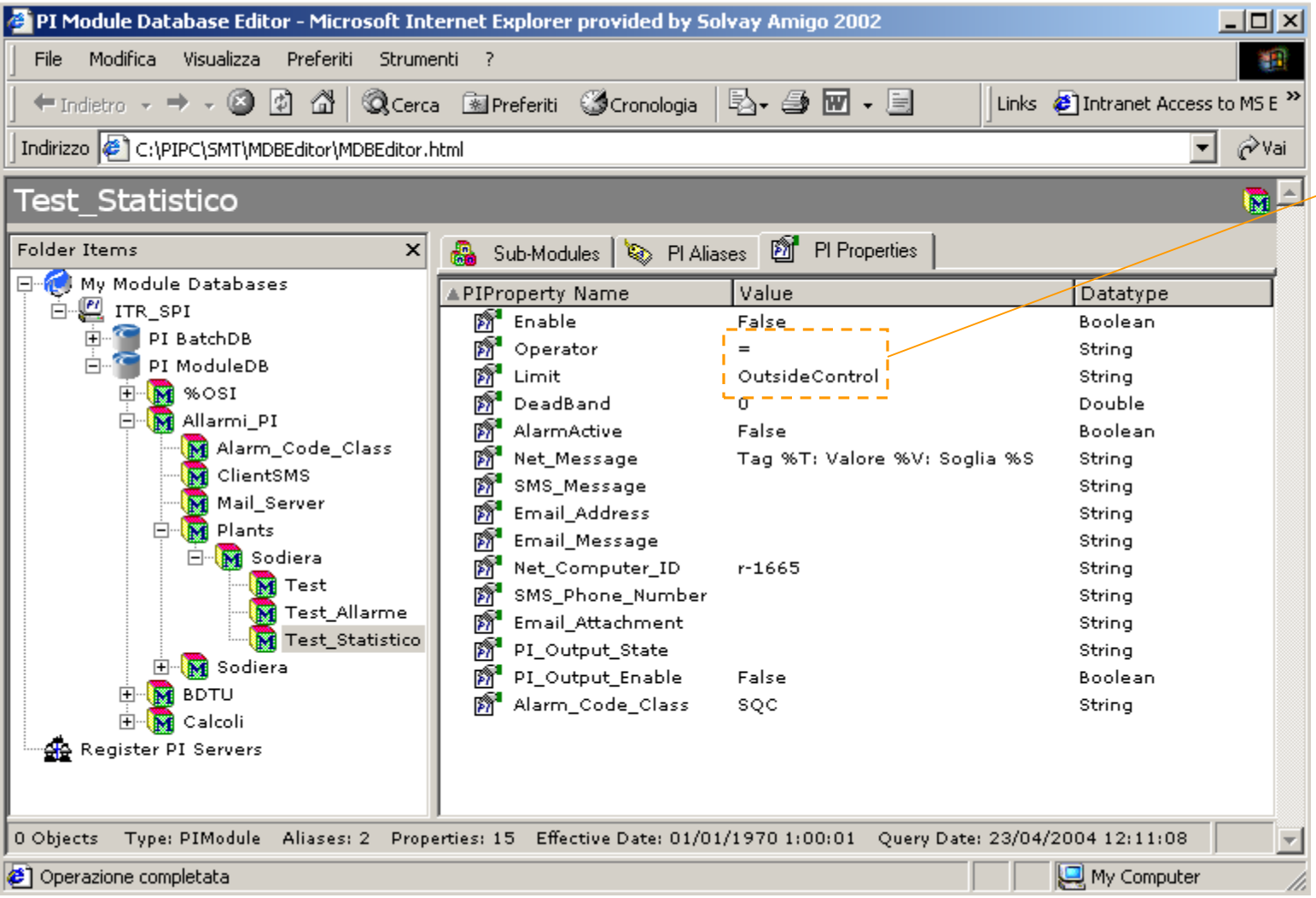
Alarm Notifications: configuration for an SQC tag



Limit condition

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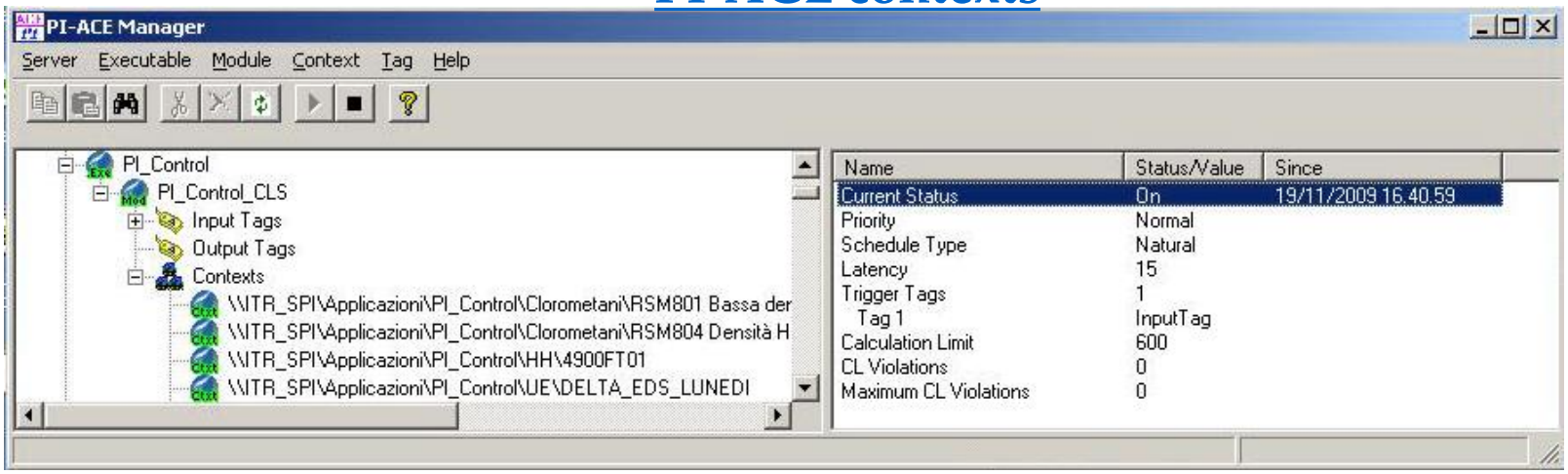
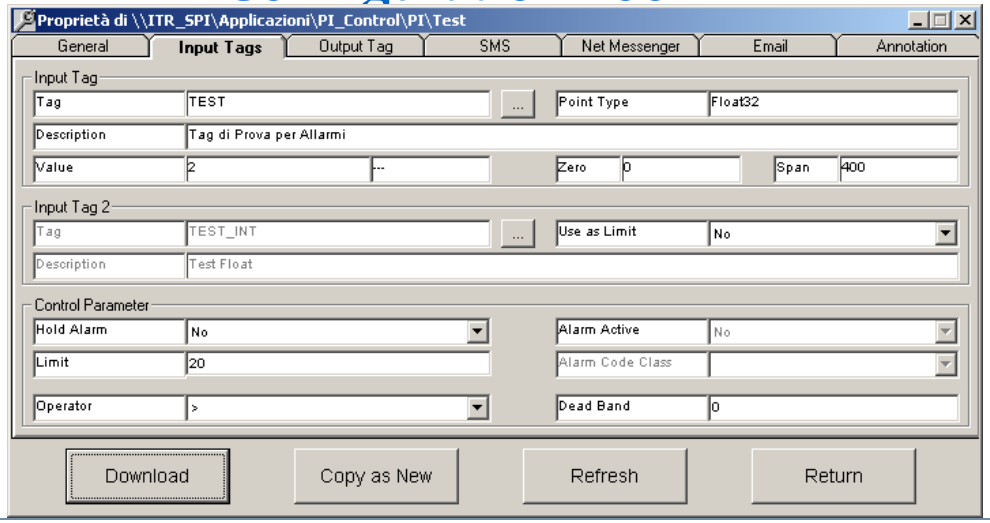
Alarm Notifications

PI-ACE contexts



Configuration Tool



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Project Costs

Batch Traceability

Purchases: PI-AF + PI-ACE + PI-Batch (if modules are not owned)

External Development/Installation: around 100 k€

Alarm Notifications

Purchases:

- PI-ACE + PI-SQC (if modules are not owned)
- Software for sending SMS and e-mail

Internal Development: around 30 working days

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Thank you

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