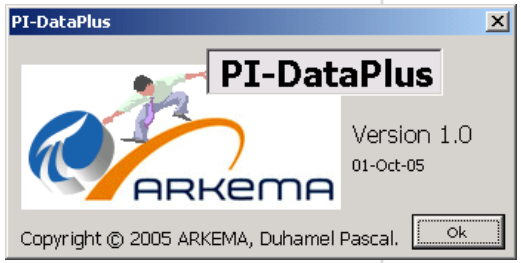
Applying PI in the Chemical Industry

Pascal DUHAMEL - ARKEMA



ARKEMA

ACTEUR DE LA CHIMIE MONDIALE

A WORLD CHEMICAL MAJOR

The birth of ARKEMA = 1st October 2004

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Arkema's ambition

- " To be an innovative player in the global chemical industry, exemplary in terms of safety and sustainable development, with a diversified portfolio of profitable and expanding activities."

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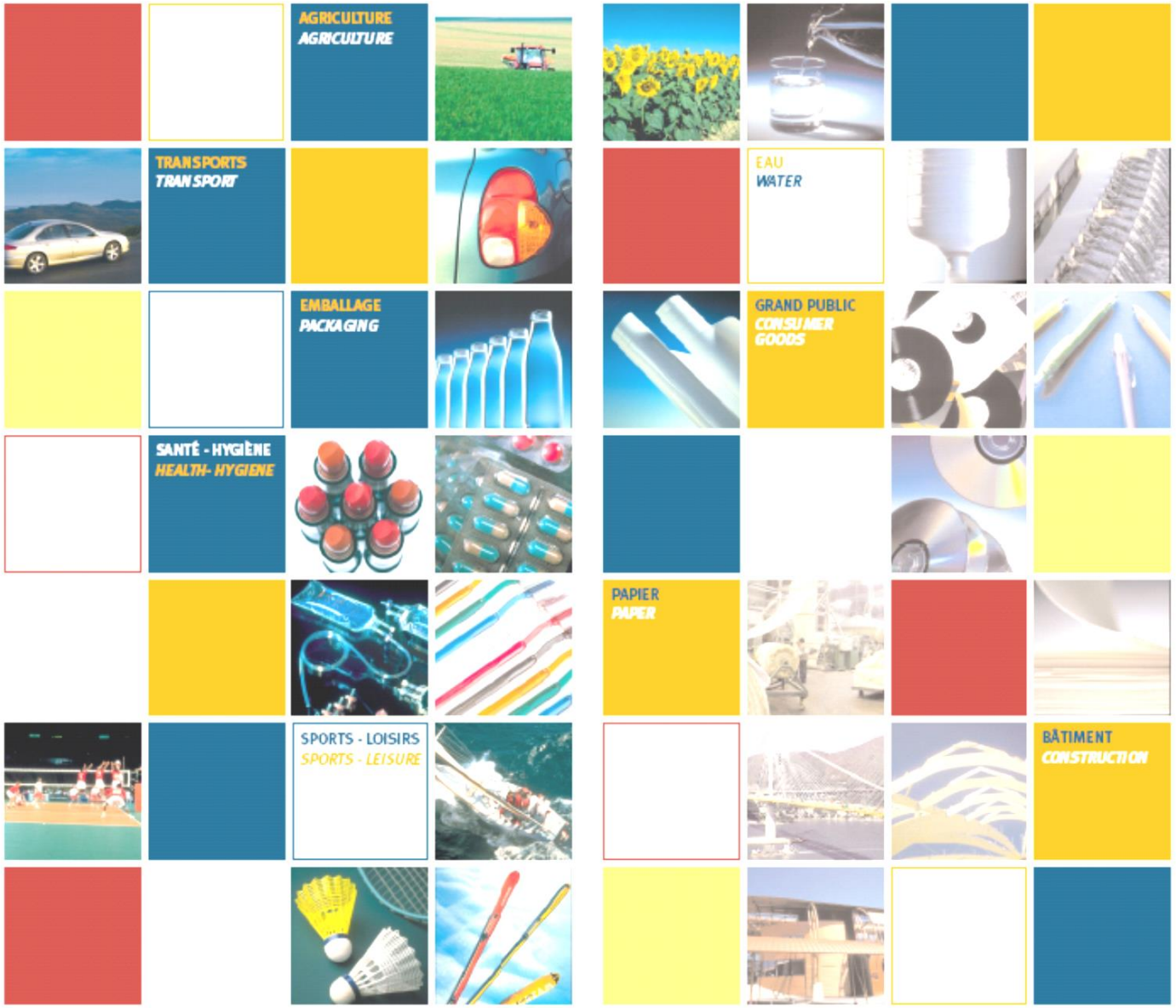
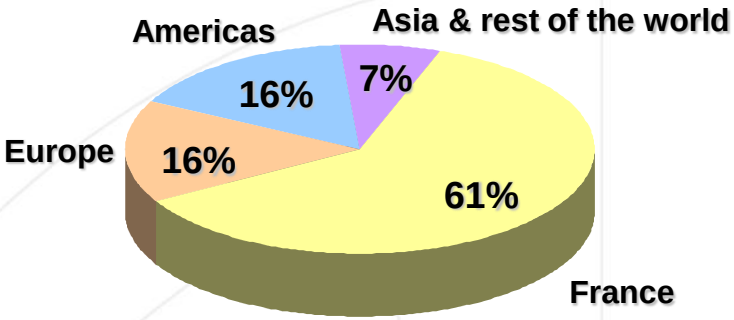
Les marchés d'Arkema / Arkema's markets

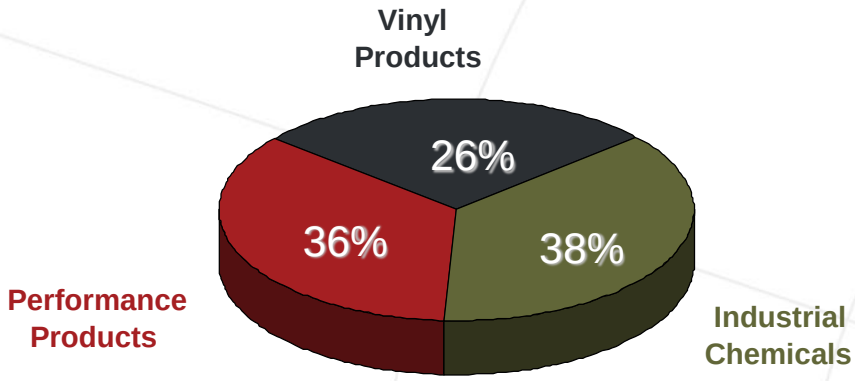


Arkema, a world-scale chemicals manufacturer

- Annual sales of 5.2 billion euros
- 120 locations around the world
- Present in 40 countries



Breakdown of Personnel



Breakdown of Sales

- 18,600 employees
- 90 plants
- 6 research centers

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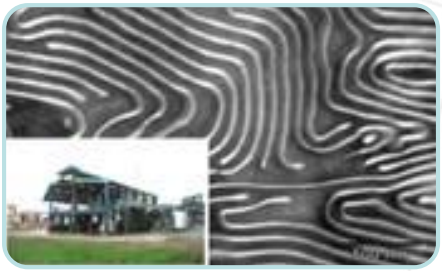
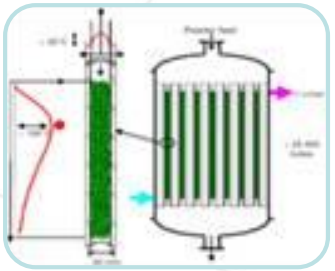
R&D, the spearhead of innovation

- Over 3% of sales allocated to research
- 1,400 researchers, 150 patents registered every year
- 6 research centers: Cerdato in Serquigny / France, CRRA in Pierre-Bénite / France, CRDE in Carling / France, GRL in Lacq / France, King of Prussia in Philadelphia / USA, KTC in Kyoto / Japan



Nanotechnologies

Marine Paints



Acrylic Processes

Fuel Cells

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Arkema worldwide

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-  Customer
  - 40 PI servers in Europe
  - 167000 points – Average of 3800 points per site

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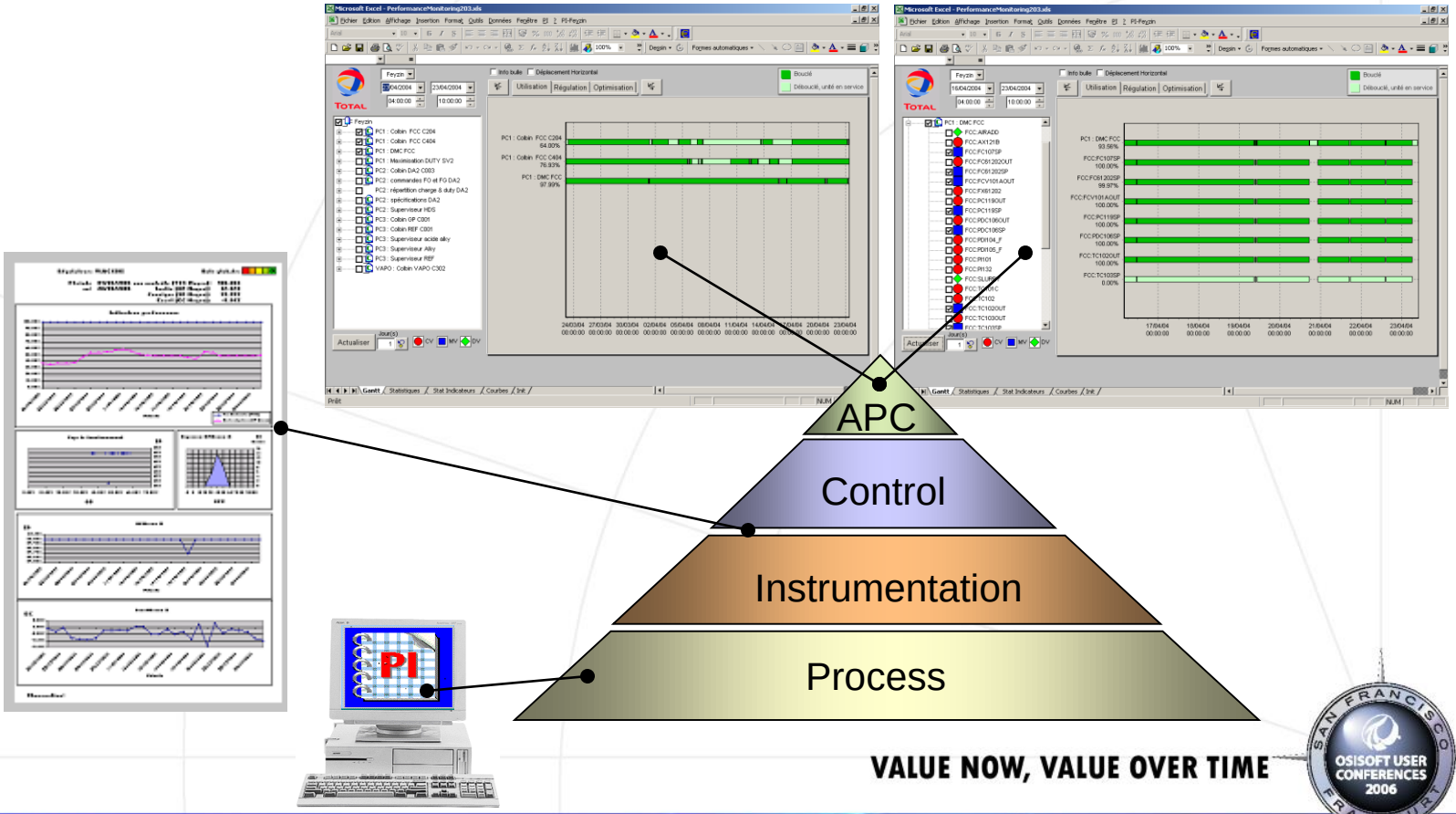
Process Control Optimization: Monitoring Tools

- Process: PI (Real-time Performance Management).
- Control Loop: Control Loop Performance Monitoring.
- APC: Performance Monitoring.



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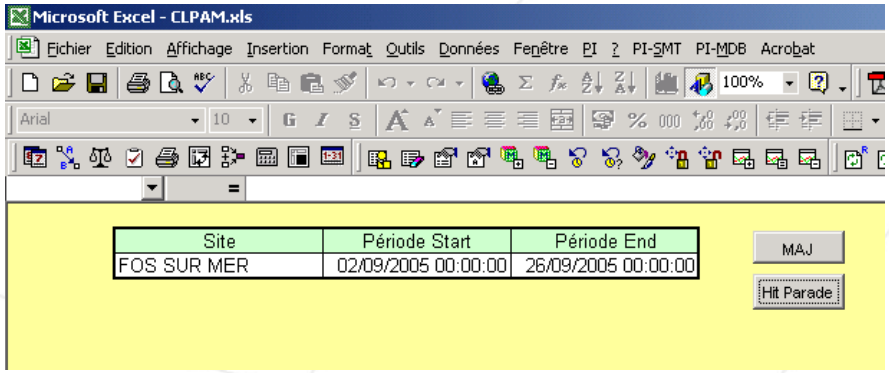
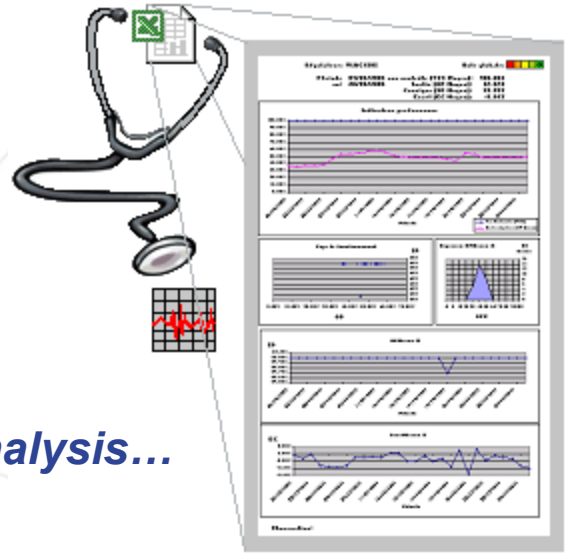
Control Monitoring Reports (example)

- CLPAM, an Excel client tool used to monitor control loops.





- ***User has to specify time range for statistics analysis…***

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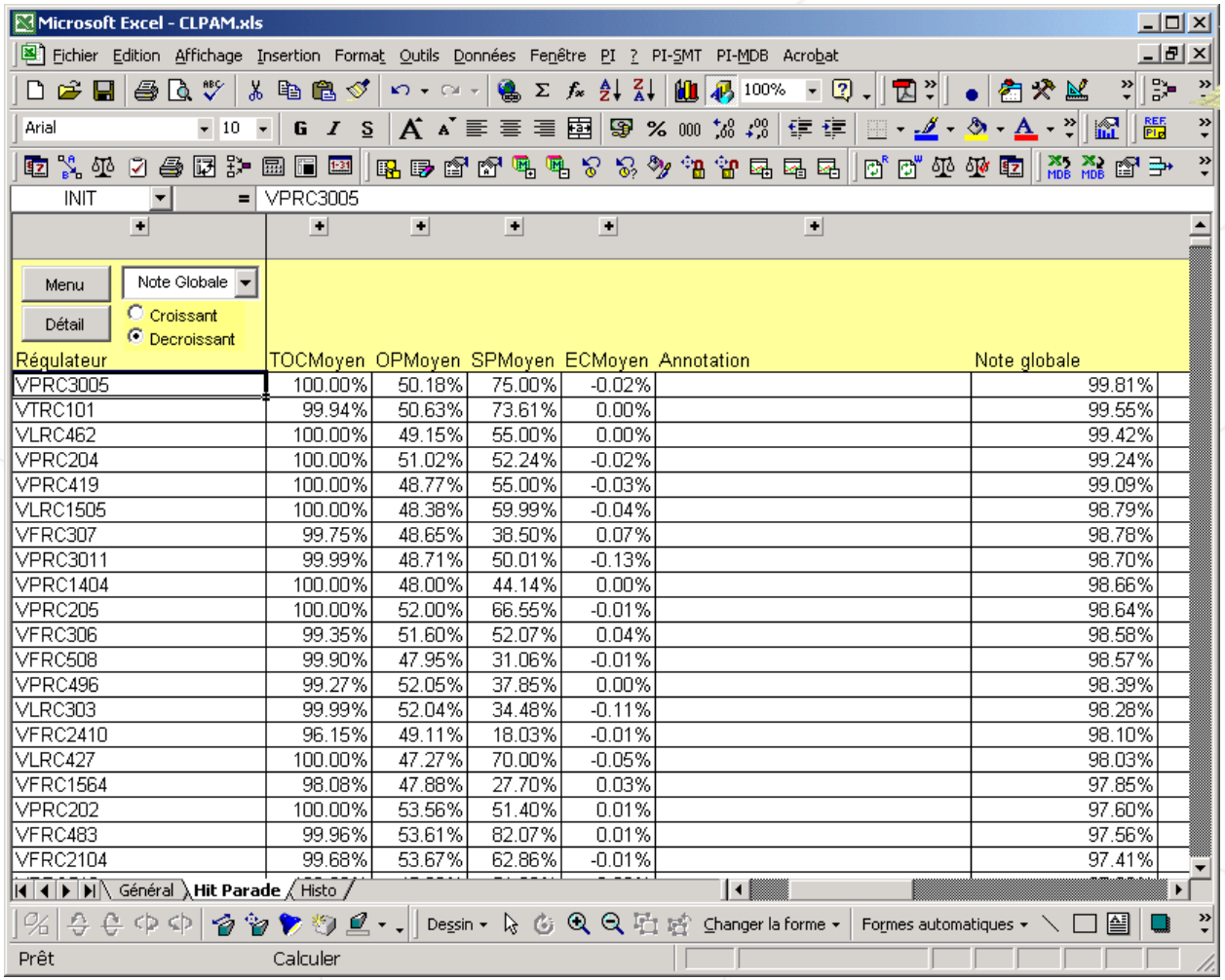
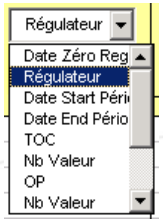
Top of the charts



Régulateur	TOCMoyen	OPMoyen	SPMoyen	ECMoyen	Annotation	Note globale
VPRC3005	100.00%	50.18%	75.00%	-0.02%		99.81%
VTRC101	99.94%	50.63%	73.61%	0.00%		99.55%
VLRC462	100.00%	49.15%	55.00%	0.00%		99.42%
VPRC204	100.00%	51.02%	52.24%	-0.02%		99.24%
VPRC419	100.00%	48.77%	55.00%	-0.03%		99.09%
VLRC1505	100.00%	48.38%	59.99%	-0.04%		98.79%
VFRC307	99.75%	48.65%	38.50%	0.07%		98.78%
VPRC3011	99.99%	48.71%	50.01%	-0.13%		98.70%
VPRC1404	100.00%	48.00%	44.14%	0.00%		98.66%
VPRC205	100.00%	52.00%	66.55%	-0.01%		98.64%
VFRC306	99.35%	51.60%	52.07%	0.04%		98.58%
VFRC508	99.90%	47.95%	31.06%	-0.01%		98.57%
VPRC496	99.27%	52.05%	37.85%	0.00%		98.39%
VLRC303	99.99%	52.04%	34.48%	-0.11%		98.28%
VFRC2410	96.15%	49.11%	18.03%	-0.01%		98.10%
VLRC427	100.00%	47.27%	70.00%	-0.05%		98.03%
VFRC1564	98.08%	47.88%	27.70%	0.03%		97.85%
VPRC202	100.00%	53.56%	51.40%	0.01%		97.60%
VFRC483	99.96%	53.61%	82.07%	0.01%		97.56%
VFRC2104	99.68%	53.67%	62.86%	-0.01%		97.41%



To sort the control loops according to selected criteria

In ascending or in descending order

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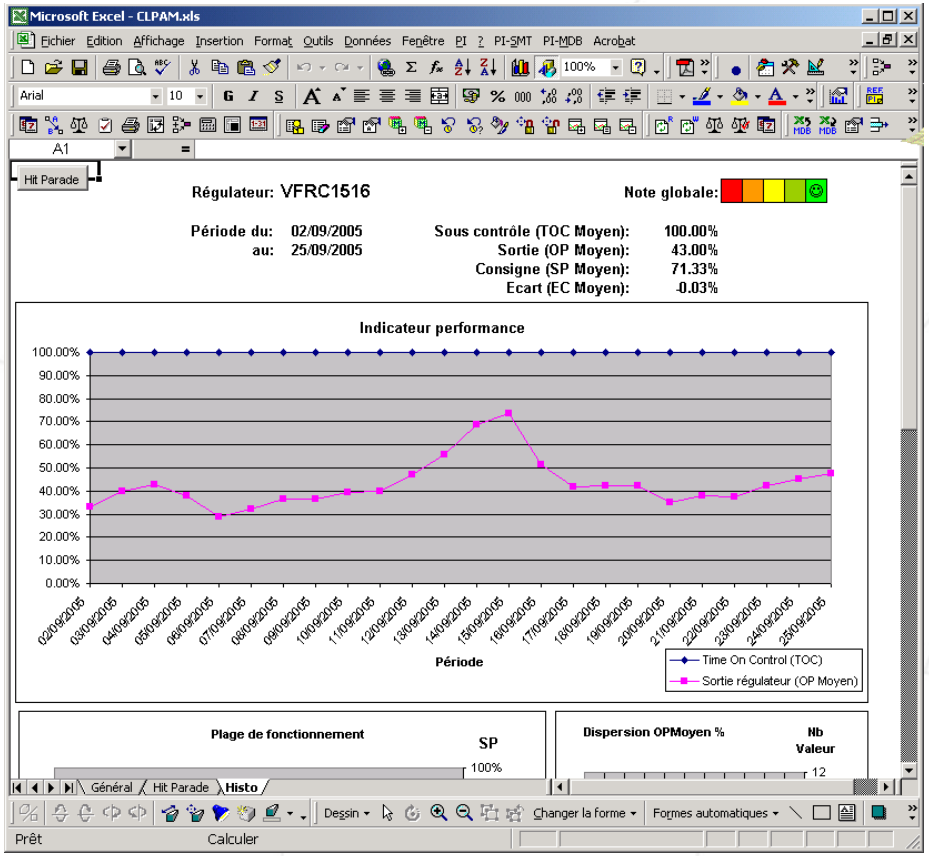
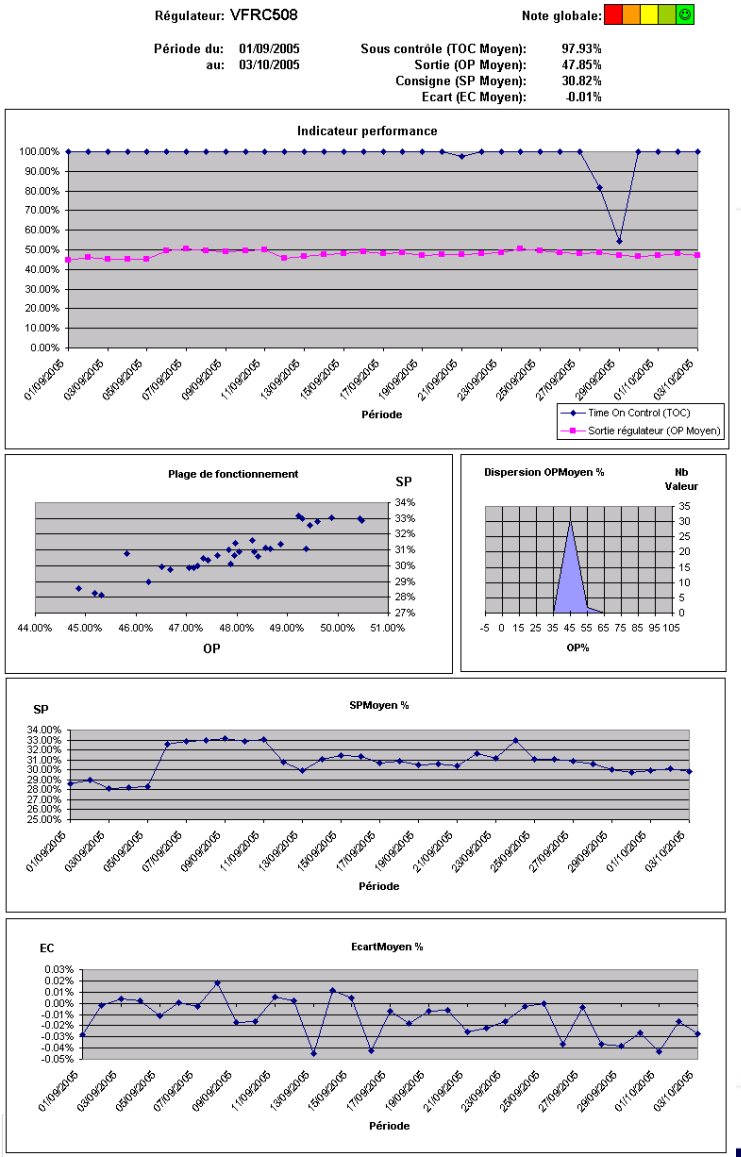
Control Monitoring Statistics in Excel

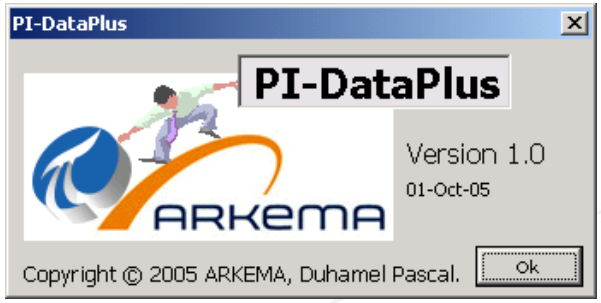
- ***To look at the control loop detail during the selected time range***





Print preview…

PI DataPlus



Excel Add-In use to:

- Publish DataSet*
- Edit DataSet*
- Do calculation mixing DataSet* and PI values in Excel.

*(array of values) stored into PI Annotation as .csv file format.

» A basic, single-value produces a single result

» Array formulas produces array result

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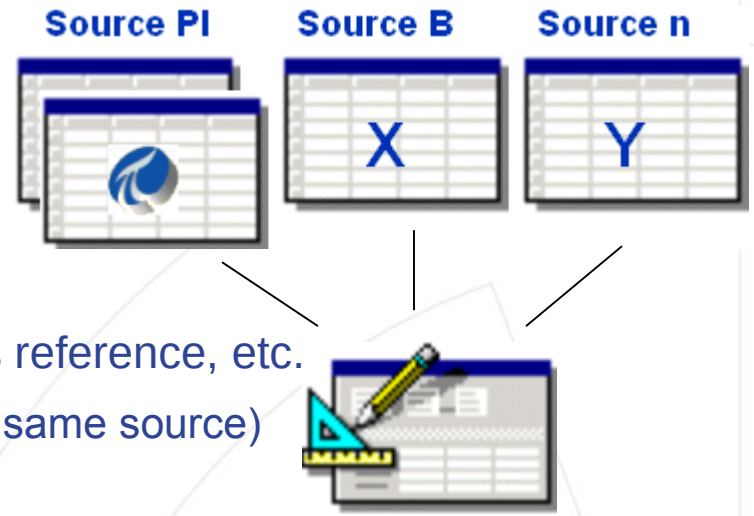
Why use PI DataPlus

- Often Excel applications involve:
  - DataSet (Table,recordset, text file, etc.)



  - Calculation, reconciliation, mixing, cross reference, etc.
    - (often DataSet doesn't come from the same source)
  - Interfaces
    - (human interfaces Forms/Reports)

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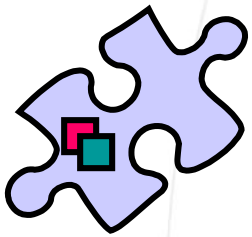
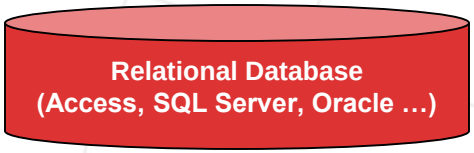
PI DataPlus Challenge

- Stay compatible with Basic standard PI Tools

  (End users master Microsoft Excel and DataLink to do reports)
- Allow users to do manual entry (like Manual Logger)
- Easy to install and deploy
- Easy to use
- Suited to small application

Use 

instead 

as far as possible.

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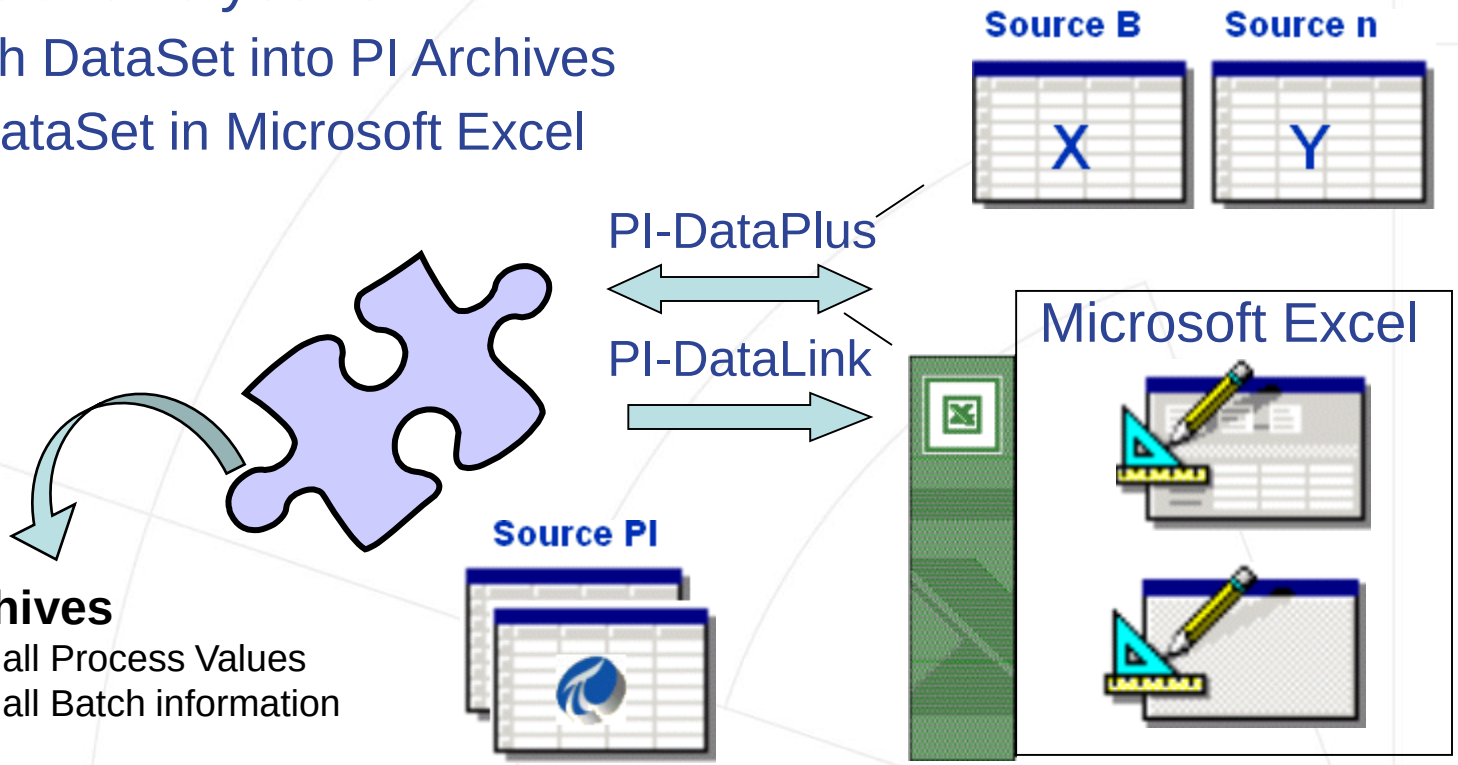
PI DataPlus

- DataPlus allows you to:
  - Publish DataSet into PI Archives
  - Use DataSet in Microsoft Excel



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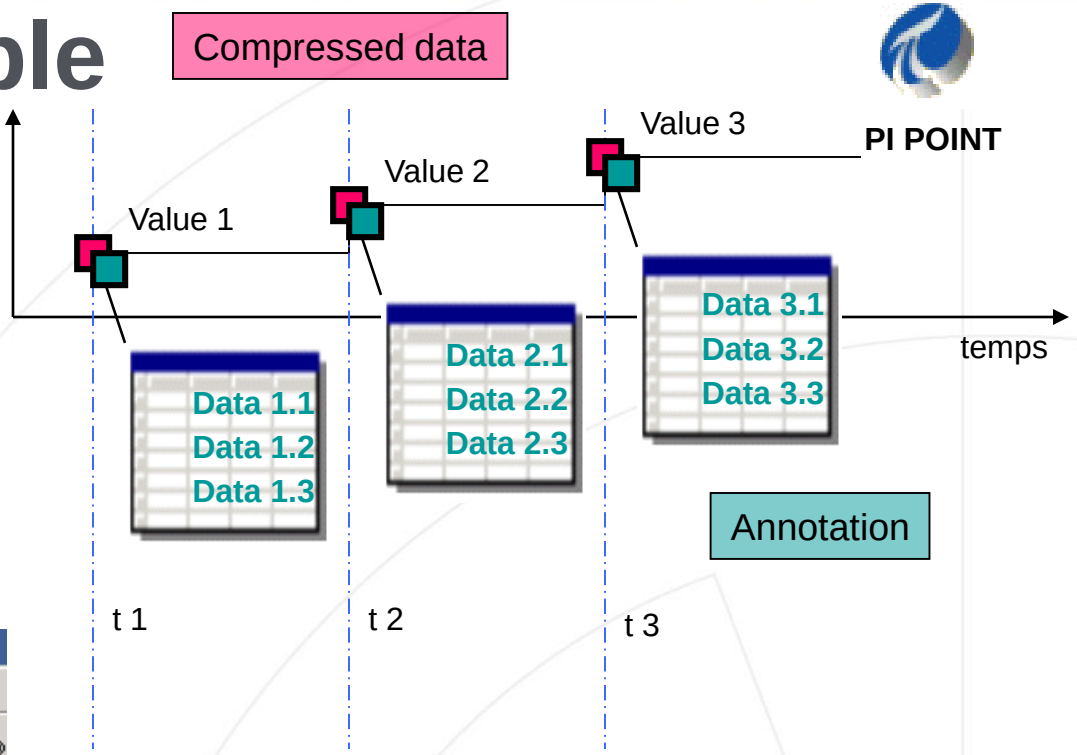
DataPlus Principle



Compressed Data

Annotation

DataSet (Array)

Microsoft Excel - Classeur2

Fichier Edition Affichage Insertion Format Outils Données

Arial 10

A1 =

	A	B	C	D
1				
2		**Date**	**Value**	**Data x.1**
3	**TAG x**	t 1	Value 1	Data1.1
4		t 2	Value 2	Data2.1
5		t 3	Value 3	Data3.1
6				
7				
8				
9				
10				
11				

PI-DataPlus

PI-DataLink

PI Archives

Annotations are sorted in a file named identical to the archive except for an ".ann" suffix

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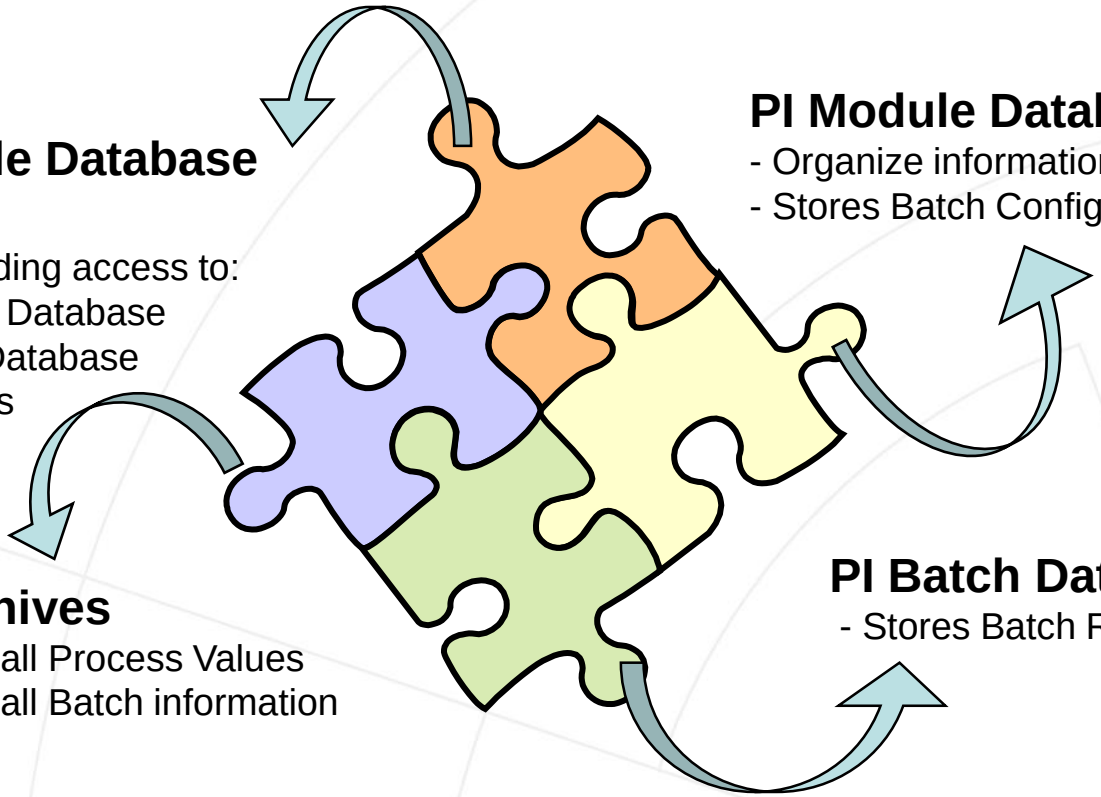
PI (Plant Information)



PI Module Database Editor

Client providing access to:
- PI Module Database
- PI Batch Database
- PI Archives

PI Module Database
- Organize information
- Stores Batch Configuration

PI Archives
- Supply all Process Values
- Supply all Batch information

PI Batch Database
- Stores Batch Records

VALUE NOW, VALUE OVER TIME

PI Point

- A Point is a unique storage place in the PI System for a specific stream of data
- A Point is defined by a set of Attributes

  - **Tag name**: unique name of the PI tag
  - **Descriptor**: PI tag description (26 characters)
  - **Engunits:** engineering units
  - **Point type**: type of the variable stored
  - **Zero**, **Span** and **Typical value**: minimum, range and typical values
  - **Point source:** allows grouping of PI tags by data interface (DCS,PLC, or other sources)
  - **Point Class:** grouping of PI Tag according to the set of attributes available

Point Types

- Digital: Discrete value (On, Off, Automatic, Manual)
- Int16: Integer value, 16 bits (0 to 32767, acc: 1/32767)
- Int32: Integer value, 32 bits (-2147450880 to 2147483647)
- Float16: Scaled Floating Point number, 16 bits (acc: 1/32767)
- Float32: Floating Point number, 32 bits (single precision)
- Float64: Floating Point number, 64 bits (double precision)
- String: Text value up to 976 characters
- Blob: Binary large object up to 976 bytes
- Timestamps : Any Time/Date in the range 1-Jan-1970 to 1 -Jan-2038

PI Module Characteristics

- Each module has:
  - Configurable information about itself – PI Properties
  - Linked tags – PI Aliases
  - Dated versions - Revision number, Version number, Effective Date, Obsolete Date and Query Date
  - System assigned information – UniqueID, Owner, Parent list,…
  - Sub-Modules with the same characteristics – PI Modules
  - Unit Batch Processing flag – Used with PI Batches

VALUE NOW, VALUE OVER TIME

PI Properties

- PI Properties are a collection of named values that can store information related to a PI module.
- A PI Property has a name and a value.
- The Value can be nearly any type: string, numeric, date array of…
- PI Properties are used to store information about a module, example:
  - Serial number, Installation date
  - Application Data
- Because you can keep versions of a module you can add/remove/change properties and keep history of these changes.
  - Recommendation: Do not replace PI Tags with PI Properties.

PI Annotations

- PI Annotations are values that can store information related to a PI value.
- A PI Annotation is a string value type.
- PI Annotations are used to store information about a value, example:
  - Comment…
- With PI DataPlus, PI Annotations are used to store values arrays of…
  - Calculated data
  - Data reports (LIMS, …)
- In DataLink 3.0, annotations can be shown by checking the "show annotations" box on either Compressed Data dialog.

Demonstration

- DataSet definition
- Publish a DataSet
- Edit a DataSet
- A basic, single-value formula produces a single result
- About array formulas and how to enter them
- Resize array formulas
- Named array formulas
- Calculated formula editor