



# Best Practices When Implementing AF

Presented by: Ales Soudek



# Agenda

- Things to Keep in Mind
- Organizational Structure
- Governance Framework
- AF Ten Commandments
- Conclusion



# First my latest kids

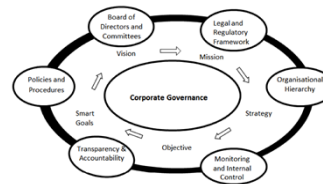




# Things to Keep in Mind



Who will consume data



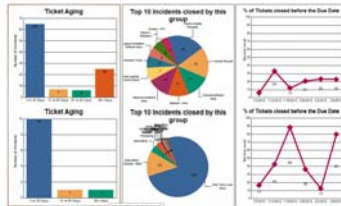
Governance and Rollout



There is no “Right Way”



Think Big – Start small



How will it be presented

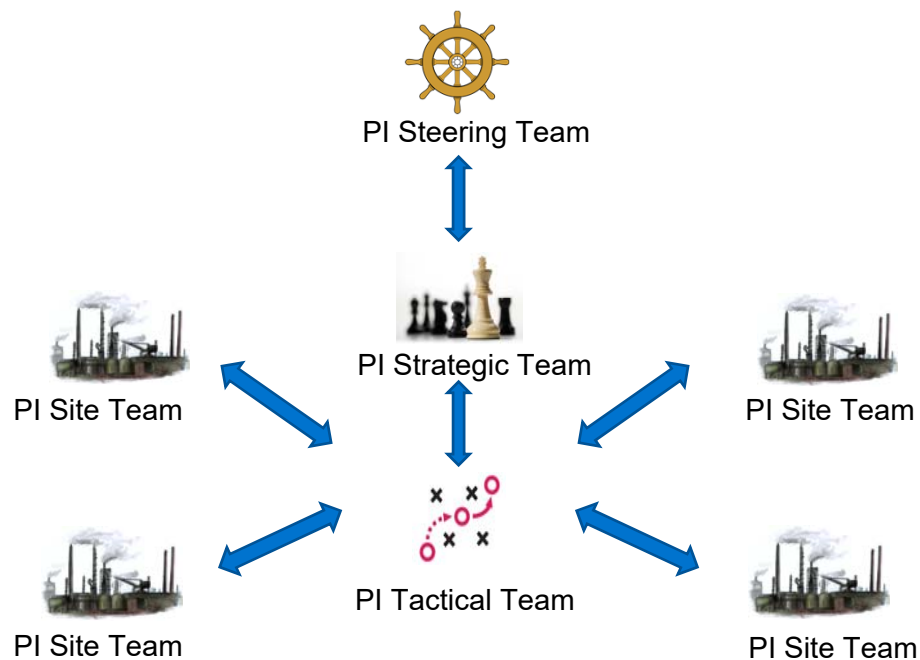


Roles/Responsibilities



Solve a specific problem

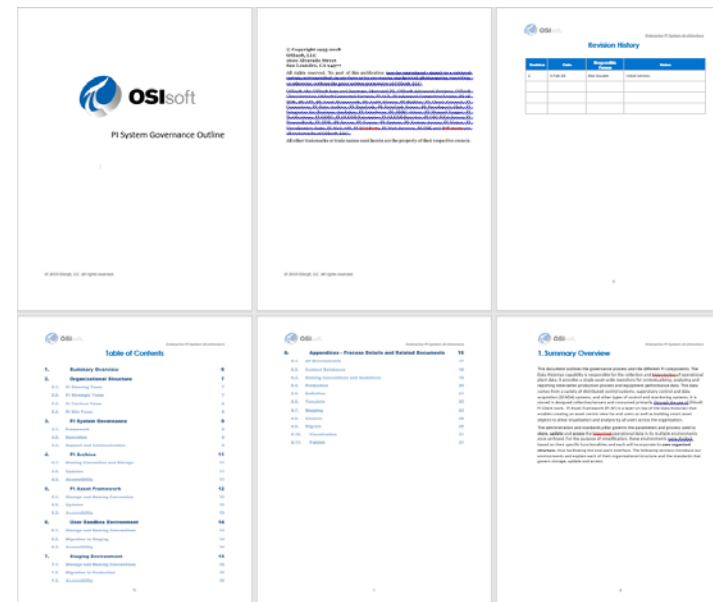
# Organizational Structure



- **PI Steering Team**
  - Vision Setters
- **PI Strategic Team**
  - Vision into Action
- **PI Tactical Team**
  - Project Execution
- **PI Site Team**
  - Supports Project Execution

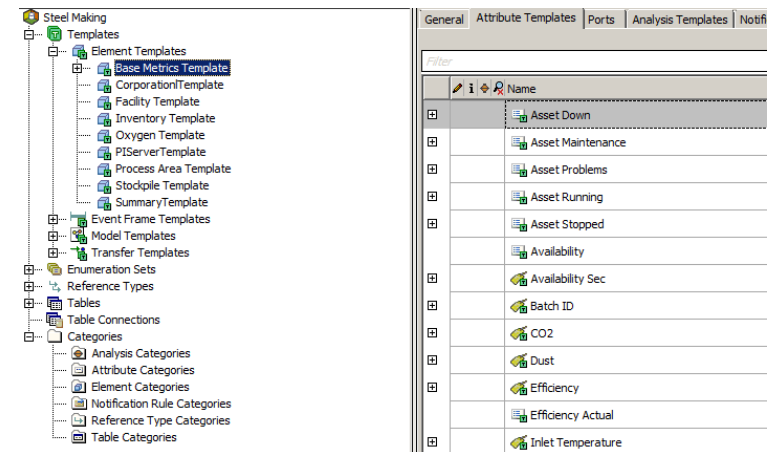
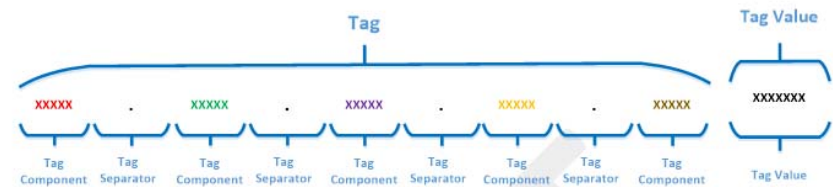
# PI System Governance Framework

- Governance Outline Doc
  - Update coming this year
- Define Teams
  - Roles and Responsibilities
- Define Rollout Process
  - From Central PI System to Sites
- Change Management Process
  - Approval Process



# Governance Framework cont.

- Define Standards
  - Integration to External Systems
  - Naming Conventions (PI Tags, AF Objects)
  - Solution Development
- Define Security and Access
- Standardize PI System Architecture
- Handling Units Of Measure

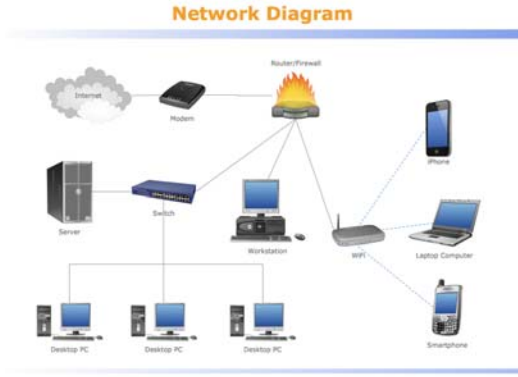


# Governance Framework cont.

- Define Documentation Requirements for Projects
  - Scope, AF Model for Project, Deliverables, etc.
- Define Process for Projects
  - Baseline
  - Measure
  - Document Value



# IT and OT Roles



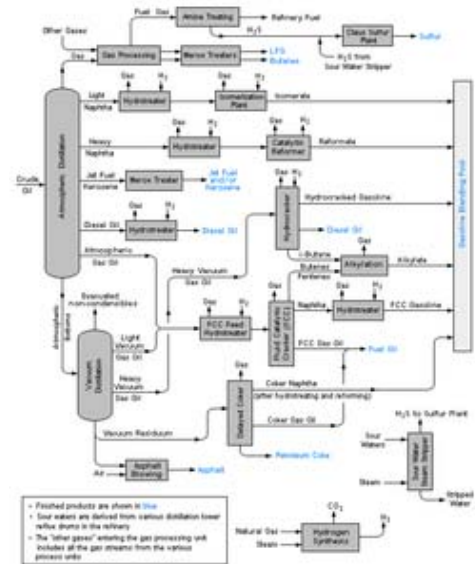
## IT - Responsibilities

- Standards
- Security - Monitoring
- Governance Framework
- Template Management
- Roll Out
- Use Cases

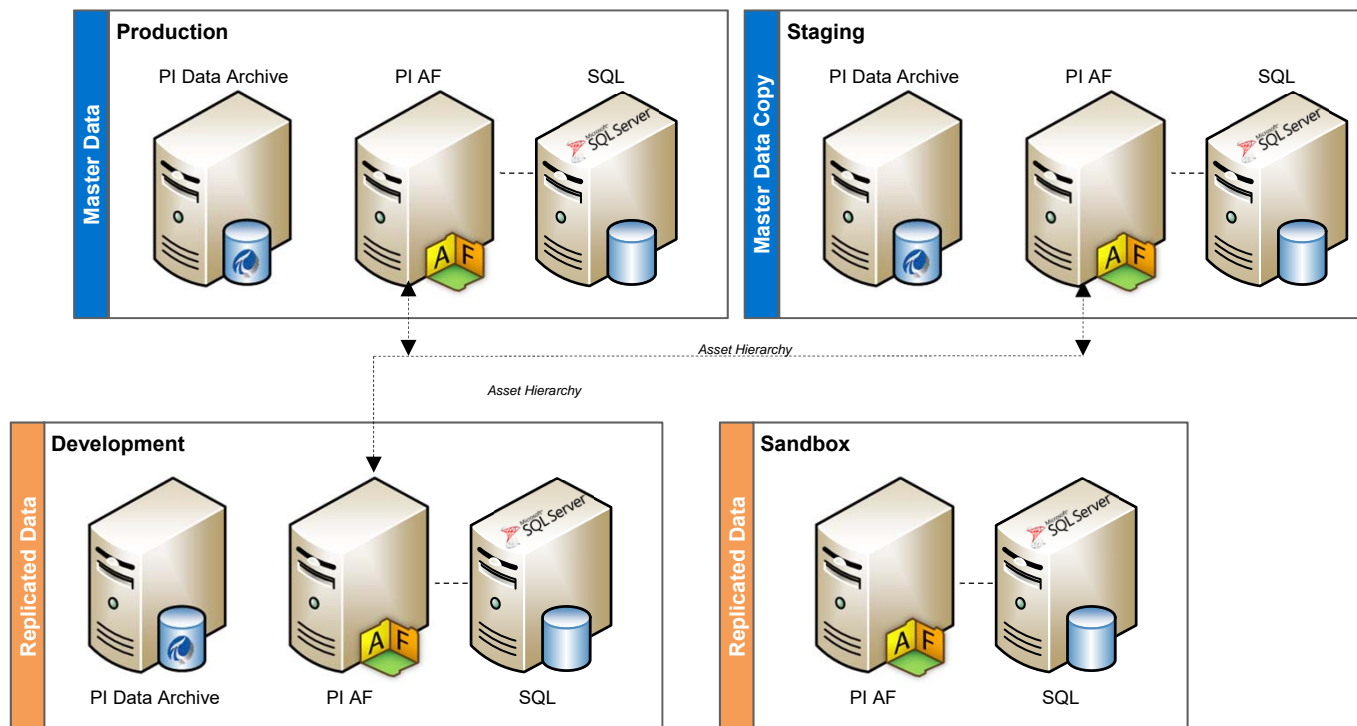


## OT - Responsibilities

- Standards
- Use Cases
- Hierarchies
- Template Content Management
- Smart Elements



# Ideal Architecture



**PI Data Archive:** Stores time series data, which can be accessed by client tools. This server does not access PI AF Server directly.

**PI AF:** PI Server component that enables organization of time-series data into logical and/or physical models.

**PI AF Database:** PI AF database (PIFD) is AF backend stored in SQL Server.

**PI System Explorer:** PI AF client tool used for AF administration.

# Before you start “cooking,” prepare a “recipe”

Choose a **business case** to define:

- **Critical assets**
- **Data sources**
  - Time series
  - Meta data
  - Structure
- **Consumers**
- **Responsibilities** for maintenance
- **Workflow** for changes



# Ales' PI AF Commandments



1. Thou shalt use **Templates**.
2. An **Element Hierarchy** shalt follow standards.
3. **Categories** shalt be used everywhere.
4. Different **Views** make life easier.
5. Get to know **PI Builder** – it is your friend.
6. **Defaults** may not your friend.
7. **String Builder** and **Event Frames** are more friends.
8. Thou shalt use **Units of Measure**.
9. Do not only consider **Bottom-Up** approach.
10. Thou shalt build **Smart Elements**.

# Thou shalt use **Templates**

## Element Classes

- Applies throughout the AF Database
- Elements, attributes, event frames, analyses, notifications, etc.

## Master Templates

- Centralized Storage
- Disseminate to Sites



## Subject Matter Experts

- Efficiency analysis
- Key Performance Indicators (KPIs)

## Can be used to auto-create PI Points

- Ensure PI Point naming consistency

## Template inheritance

- Further define relationships between assets
- Start small and grow as needed
- Balance with attribute exclusion

## Follow Company Defined Standards

- Naming Conventions
- Derived Templates
- Analytics





# An **Element Hierarchy** shall follow standards

## Follow a Standard

- Like S95, etc.
- Keep to Defined Standard

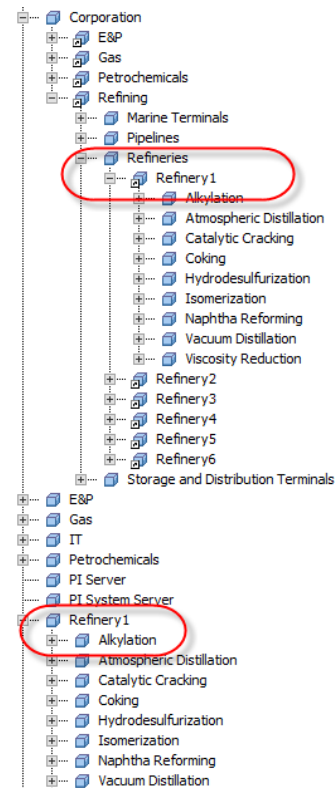
## Not SAP hierarchy

## Group by Asset Types

## Group by Initiative

- Production Reporting
- Operations

## Use Weak References for Different Views



# Categories shall be used everywhere

**Organize**

- Elements
- Attributes
- Analyses
- Templates
- Tables

**Index for Searches**

**Dimensions for BI Tools**

Element Search

Category: "Well Assets" Root: "Corporate\Oklahoma City\Permian Basin\Well Pad 1"

Criteria

Name:  x

Element Search Root: Corporate\Oklahoma City\Permian Basin\Well Pad 1 ... x

All Descendants: True v x

Template: <All> v x

Category: Well Assets v x

+ Add Criteria v

<All> x  
Company x  
Well Assets x

Results

Name	Description
Well 1	
Well 2	
Well 3	
Well 4	
Well 5	
Well 6	

Search in All Reactor

Columbus, OH Factory

Home  
PIEGenSim  
Creative Chemicals  
All Reactor  
RE100  
RE200  
RE300

Attributes

Downtime

- Downtime Active
- Downtime ReasonCode

General Info

- Factory
- Name
- Operator
- Site
- Limits
- Excursion Temp Limit High
- Excursion Temp Limit Low

Process Parameters

- Agitation

Reactor RE300

Agitation 2 rpm

Product Weight 358.7 kg

2/13/2020 1:28:35 PM



**Filter for Reports**

**More than one Category**



# Different **Views** make life easier

## By Responsibility

- Rollups
- PI Vision

## By Function

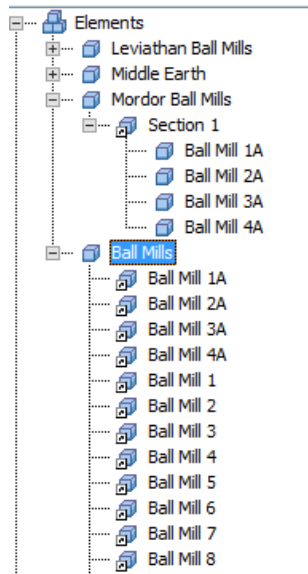
- Rollups
- PI Vision

## By Asset

- Rollups
- PI Vision

## By Reporting

- Rollups
- PI Vision
- BI



# PI Builder – it is your friend

Bulk Editing/Creation

Security Settings for Elements

A	B	C	D
Selected(x)	Parent	Name	ObjectType
x	Inventories	Inventories	Element
x	Inventories	Coal Inventory	Attribute
x	Inventories	Iron Ore Inventory	Attribute
x	Inventories	Lime and Flux Inventory	Attribute
x	Inventories	Limestone Inventory	Attribute
x	Inventories	Scrap Inventory	Attribute
x	Inventories	Mill 1	Element
x	Inventories\Mill 1	Coal Inventory	Attribute
x	Inventories\Mill 1	Iron Ore Inventory	Attribute
x	Inventories\Mill 1	Lime and Flux Inventory	Attribute
x	Inventories\Mill 1	Limestone Inventory	Attribute
x	Inventories\Mill 1	Scrap Inventory	Attribute
x	Inventories	Mill 2	Element
x	Inventories\Mill 2	Coal Inventory	Attribute
x	Inventories\Mill 2	Iron Ore Inventory	Attribute
x	Inventories\Mill 2	Lime and Flux Inventory	Attribute
x	Inventories\Mill 2	Limestone Inventory	Attribute
x	Inventories\Mill 2	Scrap Inventory	Attribute
x	Inventories	Mill 3	Element
x	Inventories\Mill 3	Coal Inventory	Attribute
x	Inventories\Mill 3	Iron Ore Inventory	Attribute
x	Inventories\Mill 3	Lime and Flux Inventory	Attribute
x	Inventories\Mill 3	Limestone Inventory	Attribute
x	Inventories\Mill 3	Scrap Inventory	Attribute
x	PIServer	PIServer	Element
x	PIServer	Name	Attribute
x	World Steel	World Steel	Element

Select Object Types and Column Headers

Object Type: Element

Template: Inventory Template

Object Types: 5 selected, Columns: 8 selected

- Required Columns
  - Selected(x)
  - Parent
  - Name
  - ObjectType
- Element
  - Template
  - SecurityString
  - NewName
  - UniqueID
  - NewParent
  - Description
  - ReferenceType
  - DefaultAttribute
  - DefaultInputPort
  - DefaultOutputPort

Clear All    Select All    More Attribute Columns...

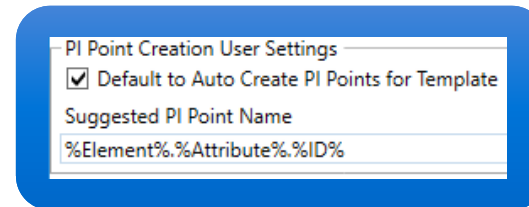
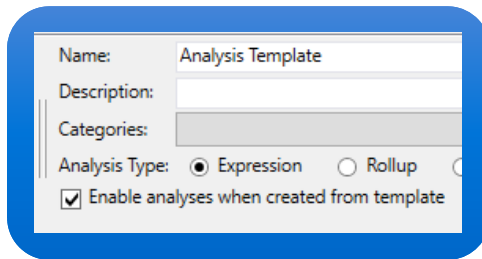
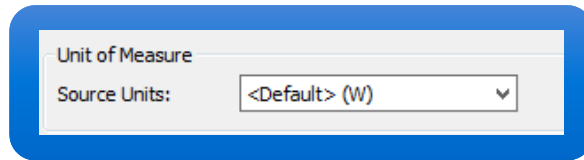
Description:

OK    Cancel    Reset



Backup

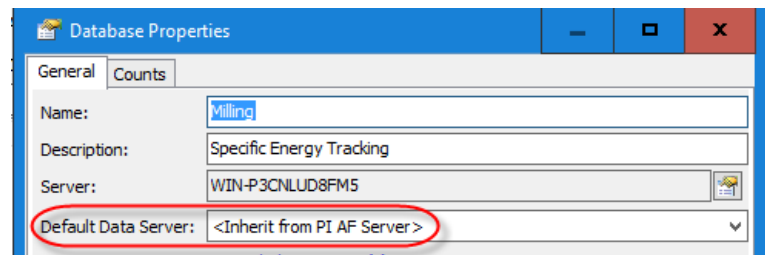
# Defaults may not your friend



## Defaults



One Exception  
%Server% (PI System 2018 SP2 or later)





# String Builder and Event Frames are more friends

## Capture Logic - EFs

- Standardized

## Analysis/Navigation - EFs

## Calculations - EFs

Event Frame Search 1

- RE100 - Downtime- 2020-02-04 09:26:00
- RE200 - Downtime- 2020-02-04 09:56:00
- RE400 - Downtime- 2020-02-04 10:14:00
- RE100 - Downtime- 2020-02-04 10:26:00
- RE200 - Downtime- 2020-02-04 10:56:00
- RE400 - Downtime- 2020-02-04 11:14:00
- RE100 - Downtime- 2020-02-04 11:26:00

Transfer Searches

- Transfer Search 1

Filter						
	Name	2/4/202... [02:03:00]	2/4/202...	Duration	Start Time	End Time
RE100	RE100 - Downtime- 2020-02-04 09:26:00			0:03:01	2/4/2020 9:26:00 AM	2/4/2020 9:29:01 AM
RE200	RE200 - Downtime- 2020-02-04 09:56:00	H		0:04:00	2/4/2020 9:56:00 AM	2/4/2020 10:00:00 AM
RE400	RE400 - Downtime- 2020-02-04 10:14:00	H		0:04:00	2/4/2020 10:14:00 AM	2/4/2020 10:18:00 AM
RE100	RE100 - Downtime- 2020-02-04 10:26:00		H	0:03:00	2/4/2020 10:26:00 AM	2/4/2020 10:29:00 AM
RE200	RE200 - Downtime- 2020-02-04 10:56:00		H	0:04:00	2/4/2020 10:56:00 AM	2/4/2020 11:00:00 AM
RE400	RE400 - Downtime- 2020-02-04 11:14:00		H	0:04:00	2/4/2020 11:14:00 AM	2/4/2020 11:18:00 AM

Not just for text –  
String Builder

## String Builder - EFs

- Get info you can't get otherwise



# Thou shalt use **Units of Measure**

## Applies to AF Server

- All databases

## Enforce Consistency

## Data Access

- PI Integrators
- PI SQL/OLEDB Enterprise



## Eliminate Hard-coded factors

- Convert()



# Do not only consider **Bottom-Up** approach

Fast Rollout

One Template

Unit Operation

Plant Operation

General | Child Elements | Attributes | Ports | Analyses

Name: 2 - Crude Unit

Description: Unit

Template: Unit

Categories: UNIT

Find: Parents Children Event Frames Models Layers Connections

Extended Properties (0) Annotations (0)

Category: Consumables			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Air Consumption	18.652 5/2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Electricity Consumption	93.259 W 5/2
<input type="checkbox"/>	<input type="checkbox"/>	Flux Consumption	0 1/1
<input type="checkbox"/>	<input type="checkbox"/>	Fuel Consumption	0 1/1
<input type="checkbox"/>	<input type="checkbox"/>	Gas Consumption	0 1/1
<input type="checkbox"/>	<input type="checkbox"/>	Oxygen Consumption	0 1/1
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Water Consumption	1108.6 US gal/min 5/2
Category: Metrics			
Category: Production Variables			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Process Feed Rate	10.454 t/h 5/2
Category: Triggers			
Category: Unit Events			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Mode	Down 5/2

Asset	Mode	Duration (min)
Crude Unit	Unit Down	86055.5
	Unit Maintenance	79939.5
	Unit Running	274501.0
	Unit Trouble	339528.0
	Total	773424.0
3 - Vacuum Tower	Unit Down	75155.0
	Unit Idle	2569.5
	Unit Maintenance	40277.5
	Unit Running	345537.5
	Unit Trouble	289915.5
4 - Gas Processing	Unit Down	90234.0
	Unit Idle	841.0
	Unit Maintenance	31195.5
	Unit Running	331885.0
	Unit Trouble	299810.5
5 - Catalytic Reformer	Unit Down	774890.0
	Unit Maintenance	74991.0
	Unit Running	303217.5
	Unit Trouble	233109.5
	Total	773479.0
6 - Diesel Hydrotreater	Unit Down	83379.0
	Unit Maintenance	59177.5
	Unit Running	305897.0
	Unit Trouble	325670.0
	Total	773614.3
7 - Hydrocracker	Unit Down	104369.5
	Unit Idle	839.0
	Unit Maintenance	6682.0
	Unit Running	294467.5
	Unit Trouble	307973.5



# Thou shalt build **Smart Elements**

## Analyses

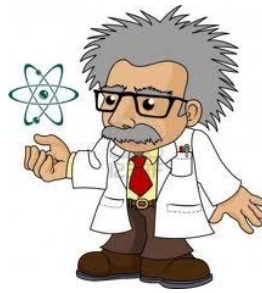
- Efficiency analysis
- Key Performance Indicators (KPIs)

## Time-series

- In-Flow
- Pressure
- Vibration data

## Events

- Downtime
- Startup
- Failure



## Asset details

- Name
- Model
- Manufacturer

## Notifications

- High speed
- Rotor failure
- Low pressure

## External data

- Performance curves
- Last maintenance date
- Design documents
- Best operating procedures



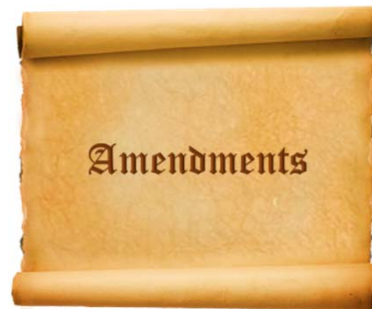
# Ales' PI AF Commandments - Amendments

## Use Enumerations

- Minimize mistakes

## Use Distinct Element Names

- Less Confusion (PI Vision)

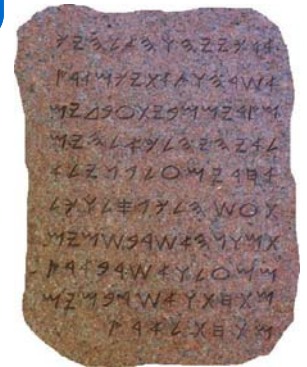


## Use Relative References

- Data References
- Generic
- Less Maintenance

## Use AF Tables Carefully

- Use Linked Tables
- Use Parameters



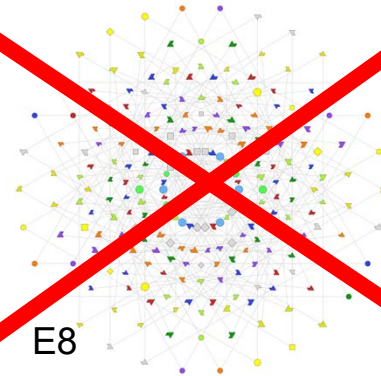


# Conclusions

- Organizational Structure and Governance
- Define and Follow Standards
- SMEs Responsibility for Template Content
- Define and Create Rollout Process
- Follow Best Practices

# The Takeaways

- Have a plan
- Only model what you understand
- Only invest in resources if you have the use case



Don't try to boil the ocean or find the theory of everything !

# Final Take Away

“A shortcut is the longest distance between two points.”

- *Charles Issawi*

## Contact Information



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# Questions?

Please wait for  
the **microphone**

State your  
**name & company**



# Save the Date...



AMSTERDAM  
October 26-29, 2020



