NOxTool - Statoil's IT solution for reporting NOx emissions from gas turbines

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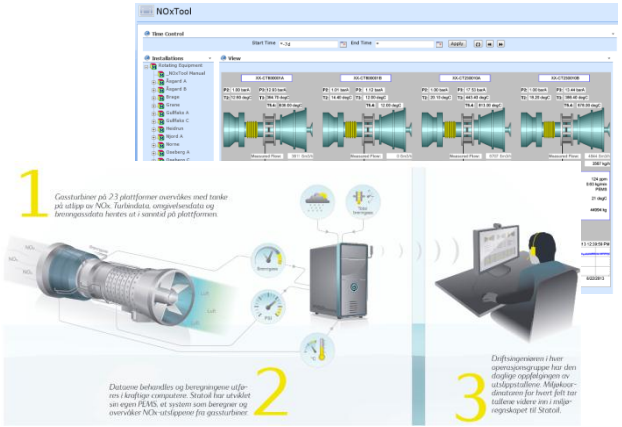
Statoil

NOxTool

“Knowing what you actually emit, is the first step towards measures to reduce emissions”

Project manager Øyvind Hjelm-Larsen
Mechanical technology

Statoil



Business Challenge

- Legal requirement for more accurate reporting of NOx emissions for conventional gas turbines at the Norwegian continental shelf.

Solution

- Extended an existing PI System which gathers, calculates, presents and stores information required for reporting NOx emission

Results and Benefits

- One common solution for 23 installations
- Using a stable PI System gave rapid development and deployment

Statoil is an international energy company with operations in 35 countries. Building on more than 40 years of experience from oil and gas production on the Norwegian continental shelf, Statoil is committed to accommodating the world's energy needs in a responsible manner, applying technology and creative innovative business solutions.

Statoil is headquartered in Stavanger, Norway with 23,000 employees worldwide, and is listed on the New York and Oslo stock exchanges. For more information, please visit www.statoil.com

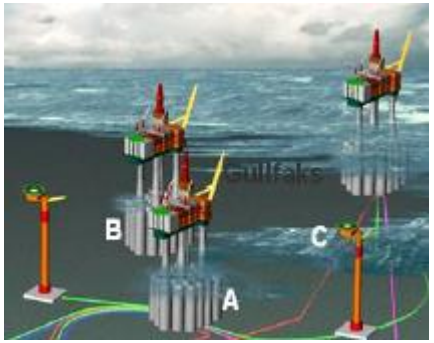
Business Case

- NOx is a generic term for mono-nitrogen oxides NO and NO2 (nitric oxide and nitrogen dioxide). They are produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures (ref. http://en.wikipedia.org/wiki/NOx).

- NOx emission is subject to tax in Norway.

- The Norwegian Environment Agency requires through the emission permits that Statoil uses PEMS, Predictive/Parametric Emission Monitoring System, or other method with satisfactory accuracy, for monitoring and reporting of NOx emissions from conventional gas turbines.

Background

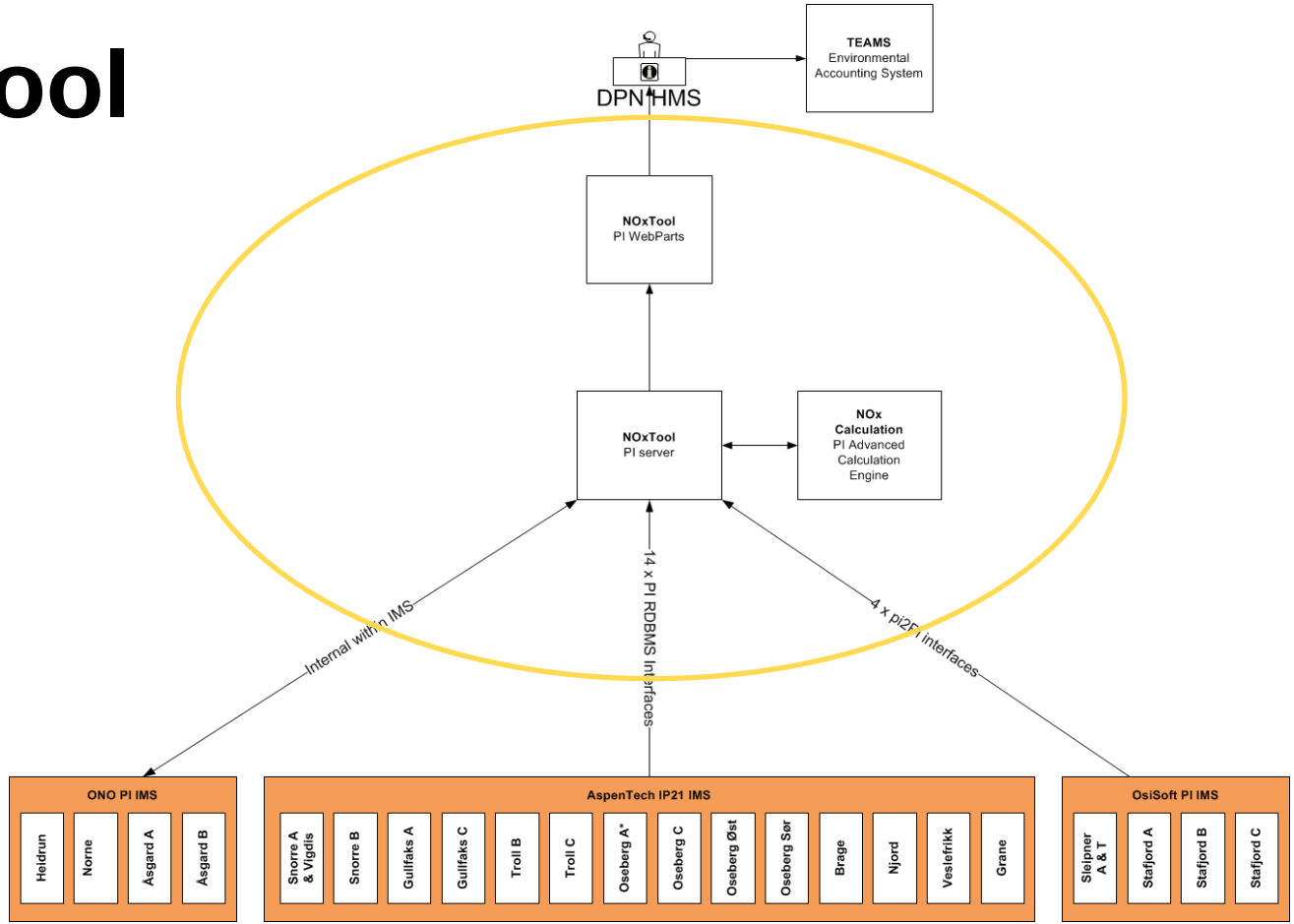


- Statoil has developed specifications for an approved PEMS calculation model for gas turbines.
- Statoil has 23 installations with 78 gas turbines (5 different types) with PEMS in current scope.
- NOxTool is a solution for gathering, calculating, presenting and storing information required for reporting NOx emission (about 1000 input tags and 1600 calculated tags).
- NOxTool is a Statoil developed system based upon OSIsoft technology.

Why using a PI System?

- Due to the high number of installations this required rapid development of a common Statoil solution to meet the Norwegian government's deadlines.
- Statoil had an existing PI System with available capacity.
- The PI System had proven stable over years.
- Deep in-house knowledge to the PI System, PI ACE and PI Interfaces.
- Access to skilled resources from Amitec an value added reseller of OSIsoft

NOxTool

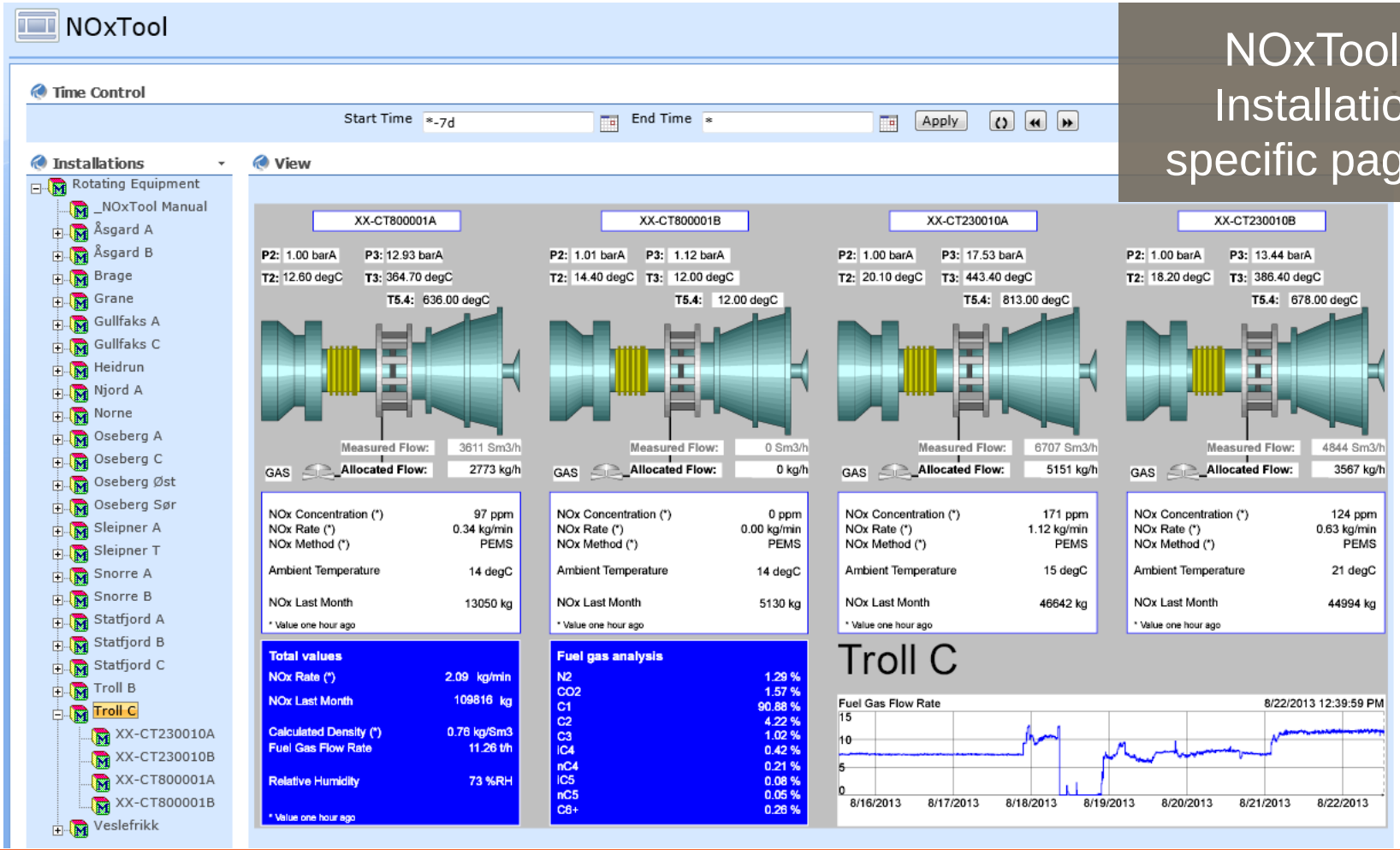


NOxTool's End User Interface

- It is a web application based upon
  - MS SharePoint
  - PI WebParts

- Rapid development
  - PI ProcessBook is used for designing and implementing the End User Interface pages.
  - The Module Database structure is reused for navigation.
  - A generic gas turbine page was developed once and reused for all turbines.

NOxTool's Installation specific page



NOxTool's End User Interface

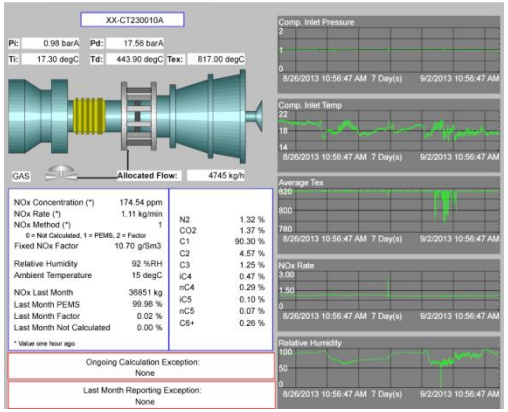
It uses out of the box features to facilitate:

- User Access Control
- **Time Control**: an easy way of specifying a start and end time
- **Navigation**: a tree view for navigation between the overview, installations and their turbines.
- **Overview page**: presenting a summary of key NOx related data for all installations and their turbines
- **Installation specific page**: presenting fiscal fuel gas information and turbine specific tags
- **Generic gas turbine page**: presenting all tags needed for calculating NOx according to PEMS method

No custom SharePoint Web Parts have been developed.

NOxTool's Calculation timing

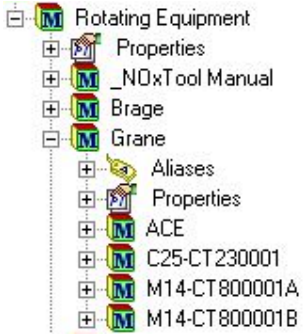
- The NOx emission PI ACE calculations are done
  - Every minute for 1600 calculated tags
  - With a delay of 1 hour to ensure that
    - All input tags have arrived
    - All pre-calculations have completed
  - Using archived values



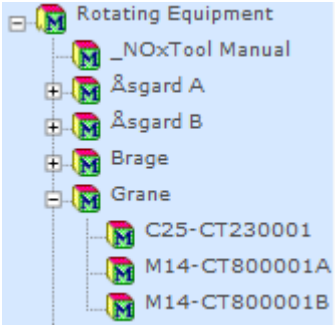
NOxTool's Module Database

- It is central to NOxTool's design
- It defines and resolves
  - the attributes needed to calculate NOx emissions using PI ACE
  - the structure needed by PI WebParts for navigation
  - the attributes needed by PI WebParts for generic presentation of gas turbines

Module Database



PI WebParts



NOxTool's OSIsoft Products

- PI Server
- PI Module Database
- PI ACE
- PI Performance Equations
- PI WebParts
- Interfaces
  - PI RDBMS
  - PI to PI
- PI AF
- PI Notifications

NOxTool - Operation

- Stable PI system since June 2012
  - very few incidents
- Future plans
  - PI WebParts 2010, using PI AF
  - PI WebParts 2013,
    - no more Adobe SVG Viewer

Lessons Learned

- Extending an existing PI System has reduced the development time.
- Using PI ACE as workaround for PI Performance Equations has improved the solution.
- Experienced technical issues by not running the “latest version” of all PI System products. i.e. PI ACE performance is improved in later versions.
- Handle all installations with few design templates.
- Creating a simple solution gives quick results and increases the stability.
- NOxTool is a stable solution which has been running since project completion June 2012.

Presenters

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