Enabling Digital Transformation through Forge

Rodney Dsylva
Senior Engineer, Tecnimont

Luca Bazzocchi
Principal Solution Consultant, Autodesk
About the speaker

Rodney Lawrence Dsilva

Rodney is a senior engineer at Tecnimont. He is a certified professional full-stack web application & software developer. He has experience in both front end and back-end software developments. Rodney enjoy using his skills to contribute to the exciting technological advances that happen every day at Tecnimont such as adopting cloud platform, data digitalization etc.
About the speaker

Luca Bazzocchi

An explorer and proud Autodesker since 2008, looking always towards the future for new challenges and learnings!

As Principal Solution Architect in Autodesk CSO, works on projects worldwide, covering different industries.

Has been adopting and evangelizing Forge since the very beginning. He is continuously looking to stand at his customers side in their Digital Transformation journey.
Maire Tecnimont
Who We Are?
Technology Driven EPC Contractor

INDUSTRY

PETROCHEMICALS | FERTILIZERS | OIL&GAS REFINING | POWER | GREEN CHEMISTRY & RENEWABLES

Maire Tecnimont
- Oil & Gas Refining, Petrochemicals, Fertilizers, Polyolefins, Power Large-scale contracting
- Refining, Hydrogen & Syngas Production, Sulphur Recovery and Process Heaters

KT
- Development and licensing of Urea Technology

Stamicarbon
- Green Acceleration Project, Technological initiatives for energy transition

NextChem
- Flexible solutions in Renewable Energy

Neosia Renewables
- Downstream Innovative Technologies

MET Gas Processing Technologies
- Project development to originate business through early involvement in investment initiatives

Met Development
- Engineering and contracting in Transportation and Civil Engineering

MORE THAN
- ~6,114 employees
- 9,114 professionals
- +3,000 professionals in Electrical & Instrumentation
- 45 countries
- 50 operating companies
## Global & Technological Leadership

<table>
<thead>
<tr>
<th>PETROCHEMICALS</th>
<th>FERTILIZERS</th>
<th>OIL&amp;GAS REFINING</th>
<th>POWER</th>
<th>GREEN CHEMISTRY &amp; RENEWABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WELL ROOTED TECHNOLOGY ORIENTATION:</strong> MARKET LEADER (#1) FOR INSTALLED CAPACITY (last 10ys)</td>
<td><strong>MARKET SHARE IN LICENSING UREA PLANTS TECHNOLOGY</strong> (#1 worldwide)*</td>
<td><strong>WELL RECOGNIZED LEADERSHIP IN LICENSING HYDROGEN TECHNOLOGY AND IN LICENSING SULPHUR RECOVERY AND TAIL GAS TREATMENT TECHNOLOGY</strong></td>
<td><strong>21G INSTALLED WORLDWIDE</strong></td>
<td><strong>TECHNOLOGIES FOR ENERGY TRANSITION:</strong></td>
</tr>
<tr>
<td><strong>30% MARKET SHARE IN POLYOLEFIN PLANTS</strong></td>
<td><strong>54% MARKET SHARE IN LICENSING UREA GRANULATION TECHNOLOGY</strong> (#2 worldwide)*</td>
<td><strong>WORLD CLASS TRACK RECORD IN LARGE GAS TREATMENT PLANTS AND REFINERY PROCESS UNITS</strong></td>
<td><strong>7th RANK ENR WORLD TOP-10 POWER MARKET ENGINEERING COMPANIES 2016</strong></td>
<td><strong>5 PROPRIETARY UNDER PARTNERSHIP FOR EXCLUSIVE LICENSING</strong></td>
</tr>
<tr>
<td><strong>50% MARKET SHARE IN LDPE PLANTS</strong></td>
<td><strong>34% MARKET SHARE IN LICENSING UREA PLANTS</strong>**</td>
<td><strong>MORE THAN</strong></td>
<td><strong>OVER 20 WITH A ROLE OF INTEGRATOR &amp; EPC</strong></td>
<td><strong>OVER 10 WITH A ROLE OF PARTNER / COORDINATOR</strong></td>
</tr>
<tr>
<td><strong>Since 1970</strong></td>
<td><strong>Since 1924</strong></td>
<td><strong>Since 1971</strong></td>
<td><strong>Since 1962</strong></td>
<td><strong>Since 1962</strong></td>
</tr>
<tr>
<td><strong>200 POLYETHYLENE AND POLYPROPYLENE PLANTS</strong>**</td>
<td><strong>172 AMMONIA AND UREA PLANTS</strong>**</td>
<td><strong>MORE THAN 250 HYDROGEN AND SULPHUR RECOVERY UNIT PROJECTS</strong>**</td>
<td><strong>MORE THAN 280 POWER GENERATION PROJECTS</strong></td>
<td><strong>DEVELOPED more than 1,000 MW wind 800 MW solar</strong></td>
</tr>
<tr>
<td><strong>MORE THAN</strong></td>
<td><strong>MORE THAN</strong></td>
<td><strong>MORE THAN</strong></td>
<td></td>
<td><strong>DESIGNED more than 560 MW wind 300 MW solar</strong></td>
</tr>
<tr>
<td><strong>~1,500 Cumulated Patents</strong></td>
<td><strong>Strong commitment to technology development</strong></td>
<td><strong>INVESTED IN INNOVATION</strong></td>
<td><strong>R&amp;D PROJECTS</strong></td>
<td><strong>In Green Acceleration (last 5ys)</strong></td>
</tr>
<tr>
<td><strong>€56MN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Maire Tecnimont is a multicultural and multinational Group

~6,114 employees worldwide

+3,000 professionals in Electrical & Instrumentation

<table>
<thead>
<tr>
<th>Location</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy, Rest of Europe</td>
<td>2,743</td>
</tr>
<tr>
<td>India, Rest of Asia and Australian Region</td>
<td>2,065</td>
</tr>
<tr>
<td>Russia and Caspian Region</td>
<td>716</td>
</tr>
<tr>
<td>Americas Region</td>
<td>45</td>
</tr>
<tr>
<td>Middle East Region</td>
<td>403</td>
</tr>
<tr>
<td>North Africa and Sub-Saharan Africa Region</td>
<td>142</td>
</tr>
</tbody>
</table>

Total employees by location: 6,114

Average age: 41.9 years
Approx. 69% graduates

Headquarters
Main offices and engineering centres
Subsidiaries, branches and representative offices
Agenda

1. Digital Transformation through Autodesk and Forge
2. Tecnimont Success Story
3. Critical Challenges & Value to Users
4. Achieved Business Goals
5. On Going Developments
Digital Transformation through Autodesk and Forge
Transform to THRIVE
Assess
Evaluate your current transformation strategy, processes, practices, and plans for implementation

Shape
Refine or define a strategy based on your business requirements and informed by Autodesk insight

Design
Define architecture from business, data, application, infrastructure, and integration perspectives

Validate
Verify workflow automation, application integration, data connection, and API feasibility

Plan
Create a path to develop, integrate, and deploy the solution with visibility of key dependencies

Define
Define and document solution processes and workflows

Configure
Adjust settings of standard software and configure content

Develop
Sprint-based development using public APIs

Deploy
Install or upgrade Autodesk technology in the solution

Train
Train key users and project teams on the new solution

Support
Analyze and troubleshoot implementation related issues
Role of Forge in Digital Transformation process at Tecnimont
Tecnimont Success Story
Maire Tecnimont Objectives

• A digital Platform that links 3D model and other systems data together

• Dynamic Reports aiming at speeding up Decision Making Process

• An accessible Platform from any Device and at any Time with the latest information

• More Stakeholders accessing and understanding 3D models easily increasing Collaboration
Benefits of using Autodesk Forge

01 VISUALIZATION ON 3D MODEL
Data are valued and can really help in accurately planning and continuously monitoring the project.

02 DYNAMIC REPORTS
Team can interact with multiple dynamic reports regarding project status, monthly work front, design quality, quantities issued and estimated.

03 DATA AGGREGATION
Data coming from multiple sources such as Oracle, BIM360, Navisworks are aggregated in a single environment.

04 PRODACTIVITY & COLLABORATION
Availability of 3D model & data in single platform improved collaboration & productivity of the project.
01. Feasibility Analysis Dashboard

Project dashboard to visualize feasibility analysis on steel structures and piping components

Features

- Perform feasibility study of steel structures and pipe components
- Visualize results of feasibility run on 3D model with dedicated color coding
- Filter and search for 3D object tag or its attributes
- Dynamic reports
- Review of data quality
Feasibility Analysis Dashboard
02. Civil Master Data Dashboard

Project dashboard to manage and visualize all the civil engineering data

Features

- Visualize Engineering Development Status
- Hold Management on 3D model
- Design Quality Monitoring
- Key Quantities Monitoring
Civil Master Data Dashboard
Forge APIs Adopted in the Solutions

Authentication

Model Derivative

BIM 360

Viewer

Data Management
Critical Challenges & Value to Users
Critical Challenges

▪ Manage Data from various sources
▪ Integrate Data with model
▪ Manage 3D model metadata
▪ Manage project deviations from standard setup
▪ Discrepancy between 3D model & other systems data
▪ Browsing 3D model on the Web
Critical Challenge: Manage Data from various sources

Render 3D Model stored in BIM 360 Hub & populate data from Material Management Tool (SPMAT)
Critical Challenge: Integrate Data with model
Critical Challenge: Manage 3D model metadata

While Loading the 3D model create Model Data Dictionary using JavaScript code

Key property wise collection of Object Ids to perform different operations on the model
Solution at the glance
Critical Challenge: Manage project deviations from standard setup

- Key model property for mapping objects with attributes that differ from project to project (e.g. specific Client requirements)
- Criticalities in integrating other systems data with relevant 3D Model
- Source code customization for each project
Critical Challenge: Manage project deviations from standard setup

Key property may differ from project to project

<table>
<thead>
<tr>
<th>PROJECT P4019</th>
<th>PROJECT P4022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe</strong></td>
<td><strong>MTQ_Status</strong></td>
</tr>
<tr>
<td>NPD_METRIC</td>
<td>Line no</td>
</tr>
<tr>
<td>200 mm x 200 mm</td>
<td>Stream No</td>
</tr>
<tr>
<td>Commodity Code</td>
<td>Nor oper temp</td>
</tr>
<tr>
<td>T01AC22V02</td>
<td>Insulation</td>
</tr>
<tr>
<td>Description</td>
<td>LineID</td>
</tr>
<tr>
<td>PIPE - A333-60E SMLS T01AC22V02 5-STD</td>
<td>Stream no</td>
</tr>
<tr>
<td>Dry Weight</td>
<td>App. Status</td>
</tr>
<tr>
<td>173.84 kg</td>
<td>Area-Line-Train</td>
</tr>
<tr>
<td>System Path</td>
<td></td>
</tr>
<tr>
<td>4-019\piping\U01\U14\U01-CW-1009\CW-1009-4\01200-CW-1009 AF180N-HN</td>
<td>Length</td>
</tr>
<tr>
<td><strong>IsolLineID</strong></td>
<td></td>
</tr>
<tr>
<td>140-CW-1009-4</td>
<td></td>
</tr>
<tr>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Piping System</td>
<td></td>
</tr>
<tr>
<td>CW-1009</td>
<td></td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
</tr>
<tr>
<td>CW-2009-4</td>
<td></td>
</tr>
</tbody>
</table>
Critical Challenge: Manage project deviations from standard setup

Project setup required to customize properties. No need to change the code for each project.
Critical Challenge: Discrepancy between 3D model & Other Systems Data

Rectify data mismatch between 3D model & database.
Critical Challenge: Discrepancy between 3D model & Other Systems Data
Critical Challenge: Browsing 3D model on the Web

Use of OTG Instead of SVF file format

- More compact than the SVF format
- Navigation Lightweight & smooth
- Stable object ID's across versions of the model(s)
- Automatically converted OTG format during loading of 3D models in BIM 360
Critical Challenge: Browsing 3D model on the Web

Automatically converted to OTG format while uploading in BIM360
Browsing 3D model using OTG format
Value to Users

- Provide coherent and responsive User Experience to push adoption in the Company
- Merge different 3D Models on same Forge Viewer instance to manage “engineering vs fabrication”
- Custom MS Word Report creation from the application to be shared with different stakeholders (e.g. Client, SubContractors, etc.)
Value to Users: User Experience

Forge Viewer **crashes** when trying to load large 3D models when you move the camera slightly and Forge Viewer's **progress-bar flickers**, taking 'forever' to load a large design.

User’s need to wait for a **long time to complete loading** & fetching metadata from the model objects.
Value to Users: Implementation of Multi Model Feature

- Full 3D model divided into sub-models based on Area/Department
- Design layout of folders in BIM360 Docs
- Select only required models to visualize on the Forge viewer
- Read less model metadata while loading
- Efficient Model data Management
Value to Users: Implementation of Multi Model Feature

Data Dictionary to store model wise data

```javascript
const modelDataDict = {
  0: {
    isVisible: true,
    marksInModel: (1462) [1, 1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1],
    modelID: 2,
    steelIDBars: [168-1: Array(2), 168-10: Array(12), 168-11: Array(4), 168-12:
    __proto__: Object
  },
  1: {
    isVisible: true,
    marksInModel: (2194) [1, 1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1],
    modelID: 1,
    __proto__: Object
  },
  2: {
    isVisible: true,
    marksInModel: (6541) [1, 1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1],
    modelID: 3,
    __proto__: Object
    lastIndex: (...)
    lastItem: (...)
    length: 3
    __proto__: Array(0)
  }
};
```
Implementation of Multi Model Feature
Value to Users: Merge 3D Models on same Forge Viewer

Load Isometric Model and Spool model on same Forge Viewer

Remove Isometric objects and replace with Spools
Merge 3D Models on same Forge Viewer
Value to Users: Custom MS Word Report with Forge
Value to Users: Custom MS Word Report with Forge
Custom MS Word Report with Forge
Achieved Business Goals
High Productivity at Low Cost

Improved Collaboration for more Efficient project Delivery

Enhanced Data Integration

Tackling project criticalities proactively before they affect schedule or results
DISCIPLINE LEADER
“Dynamic reporting and data visualization directly on 3d model is the most effective way to analyze the project status and address timely criticalities”

PROJECT MANAGER
“This integrated platform is a very disruptive tool that enhance communication and collaboration within all stakeholders bringing real value to the Project“

BUSINESS MANAGER
“Digital transformation can strongly contribute to business empowerment and these integrated dashboards are a perfect proof of this attitude”

CONSTRUCTION MANAGER
“The feasibility dashboards helps me in reviewing the installation priorities and evaluating erection work fronts“
BUSINESS MANAGER
“Digital transformation can strongly contribute to business empowerment and these integrated dashboards are a perfect proof of this attitude”

PROJECT MANAGER
“This integrated platform is a very disruptive tool that enhance communication and collaboration within all stakeholders bringing real value to the Project“

DISCIPLINE LEADER
“Dynamic reporting and data visualization directly on 3d model is the most effective way to analyze the project status and address timely criticalities”

CONSTRUCTION MANAGER
“The feasibility dashboards helps me in reviewing the installation priorities and evaluating erection work fronts“

CAE SYSTEM ENGINEER
“Leveraging Forge for building new application to satisfy Business needs is always an exciting challenge…..and this is just the beginning!“
On Going Developments
Civil Master Data Database

Accurate quantities extraction from the 3D model and quantities endorsement as per Company Price Code List

Model Derivative API

Automatically extract Pre-Accounting Sheets
Digital Platform using IoT Systems

Digital Platform integrated with IoT systems to track Sub-Contractor Activities at Site

Resource tracking in Forge Viewer