PTC® Live Global

Innovative use of Creo for Digital Product Development

Chandrashekhar V Joshi
Asst General Manager – KBE and DPD Systems - TATA MOTORS

Tushar C Gadhave
Sr. Team Leader – KBE and DPD Systems - TATA MOTORS

09/06/2015

TATA Group

TATA

IMPROVING
THE **QUALITY** OF LIFE

TATA Motors

- Tata Motors Limited is India's largest automobile company, with consolidated revenues of USD 38.9 billion in 2013 -14.
- Leader in commercial vehicles in each segment and the top in passenger vehicles with products in the compact, midsize car and utility vehicle segments
- Global world's fourth largest truck and bus manufacturer.
- Subsidiaries/associates: Jaguar Land Rover, Tata Marcopolo, Tata Hispano, Tata Motors Thailand, Tata Motors South Africa

Product Family

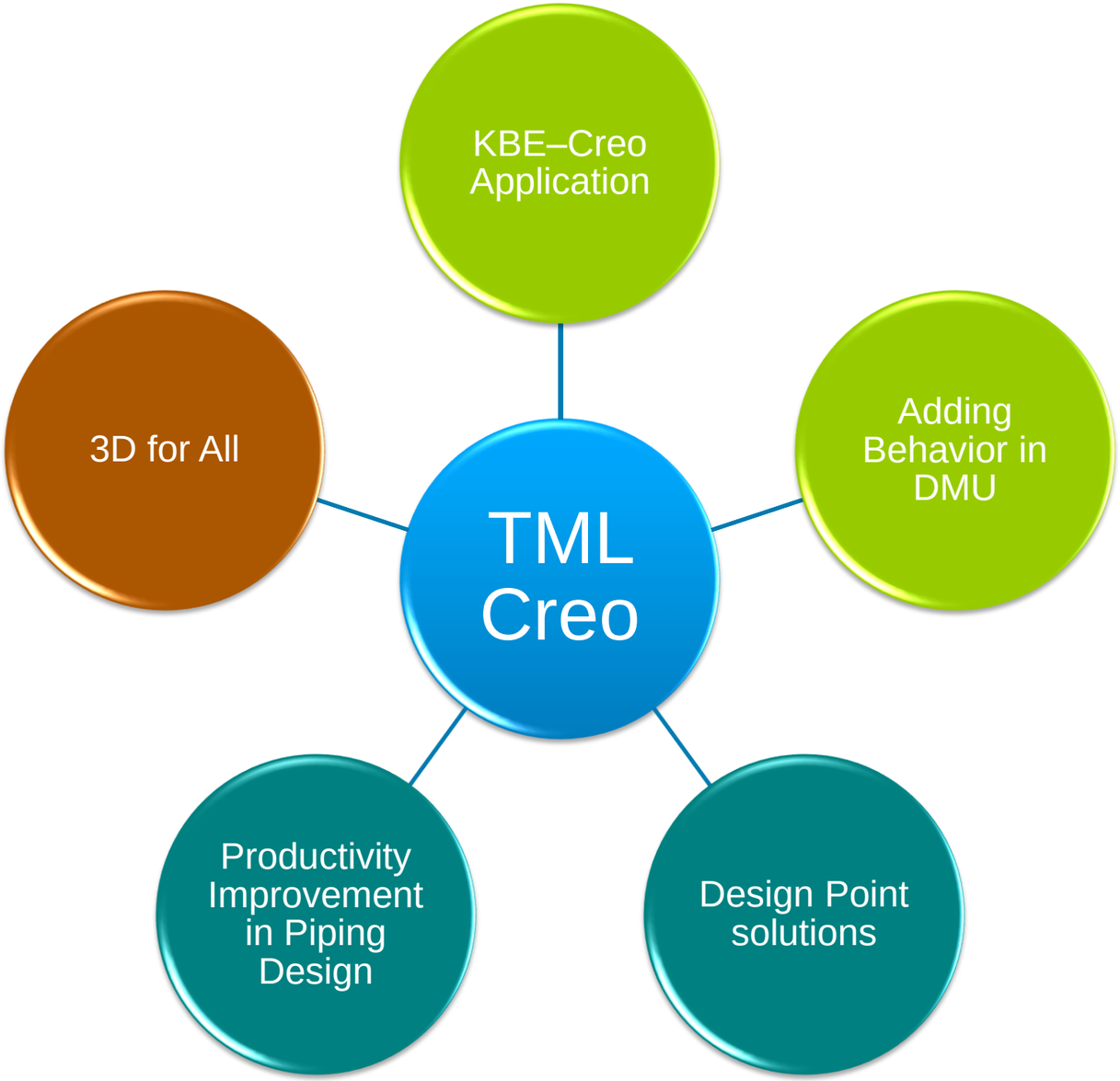
Innovative use of Creo at Tata Motors

Okay, We are leveraging functionality and deriving the values of Creo, are you ?

Key Drivers for Innovation

Key Drivers for Innovation

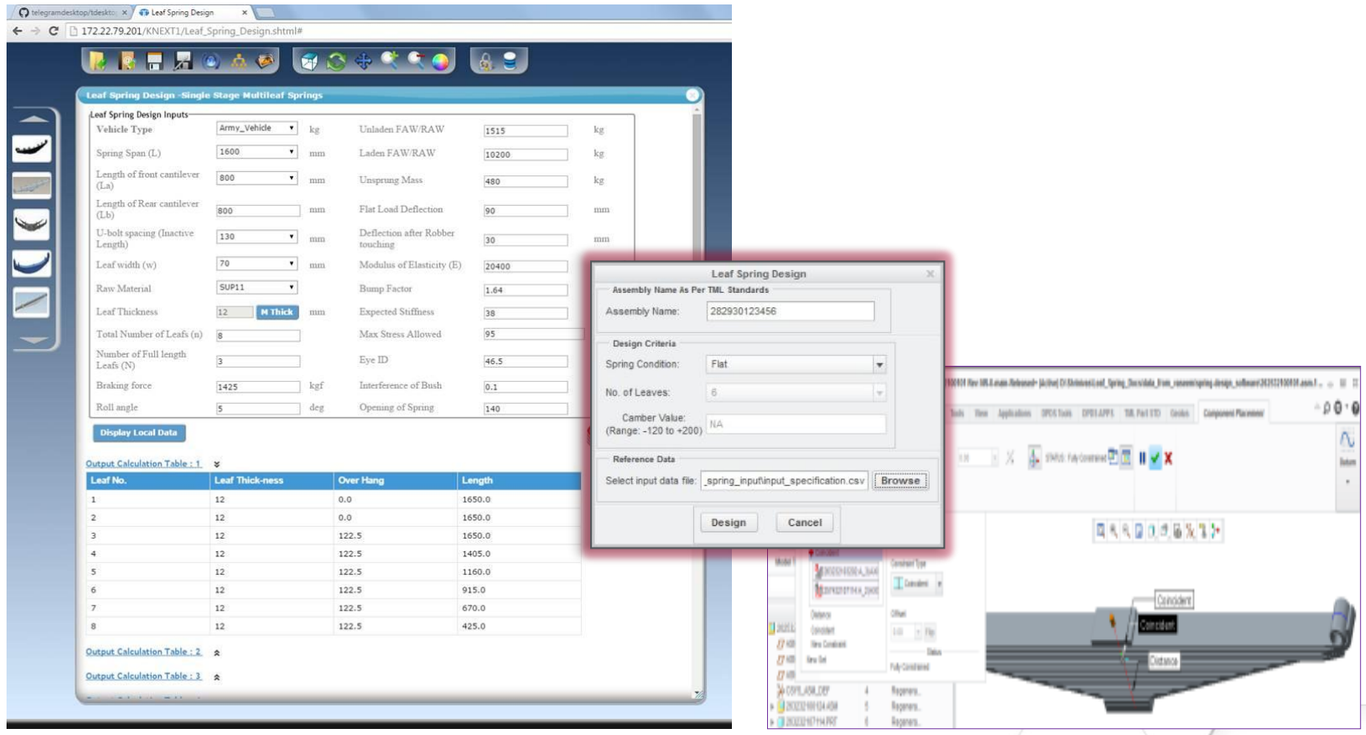
Innovative use of Creo for Digital Product Development



KBE – CREO Integration

Knowledge Based Engineering (KBE)

- In-house developed framework
- Merging of knowledge rules with CAD
- This framework is used to
  - **Capture** Best Practice
  - **Reduce** Cost / Weight
  - **Improve** Quality
  - **Shorten** Design Cycle
  - **Integrate** Engineering Processes
- Helps the organization in
  - Conceptualization
  - Detail Design
  - Manufacturing Planning
  - Trouble shooting in prove-out

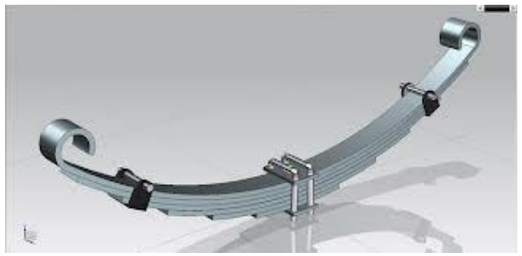


KBE - Leaf Spring Application

Objective and Scope

- **Process** — To provide a standard process for leaf spring design
- **Minimize** — Reduce designer's time and effort.
- **Single Point Solution** — Applicable to all leaf spring types with 3D and 2D model
- **Editable Geometry** — Geometry creation with feature history
- **Reuse** — Reuse standard parts from PLM system
- **Quality** — To get first time right quality and Model Standardization

Leaf Spring Design



KBE Application for Leaf spring Design:

Single UI Creo Application to generate Leaf Spring Assembly with Drawing

KBE App for Leaf Spring Design

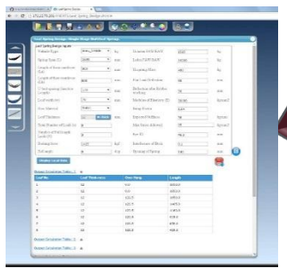
Pro/Toolkit Feature Library for Leaf Creation

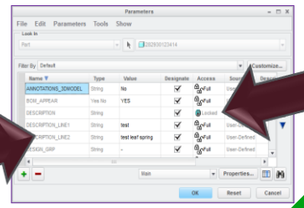
Creo Application updates All STD parameters Automatically

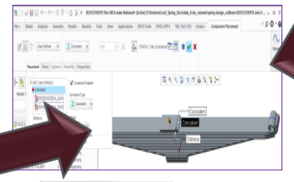
Automatic Leaf Spring Assembly creation

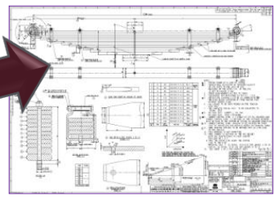
PLM Connectivity and Reuse of existing STD Parts through Application

Automatic 2D Drawing Creation









Design calculation

Leaf Design

Apply TML Design STD

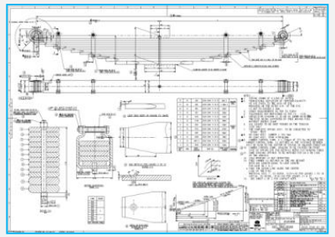
Assembly of Leaf Spring

Assembly of STD parts from PLM

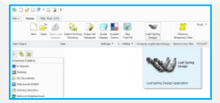
Drawing Creation

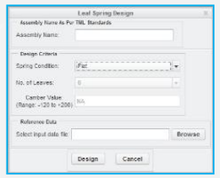
KBE - Leaf Spring Design Process

Benefits of Leaf Spring Design Application



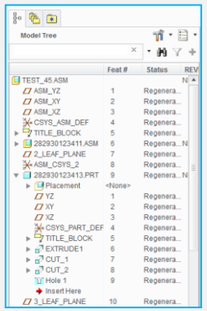
Creates 2D drafting with full views, section views and required notes



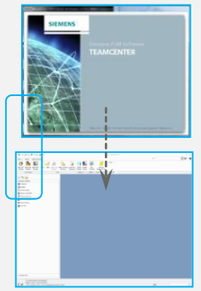


Leaf Spring Application UI

- Single User interface to Design leaf spring assembly
- Automatically Creates 3D assembly model and 2D drafting

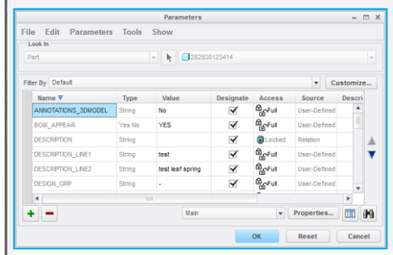


Creates model with editable features and keep references and history



PLM - Creo

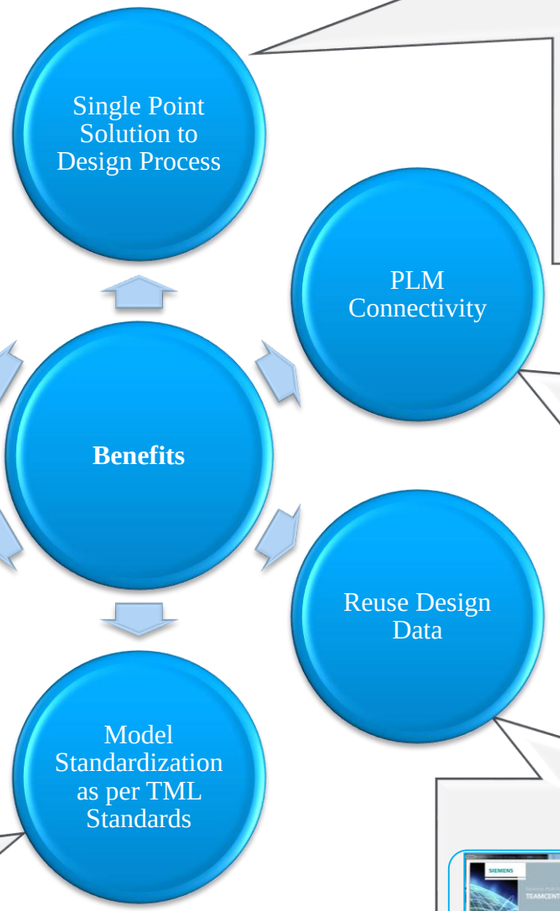
Creates the model in PLM Creo environment



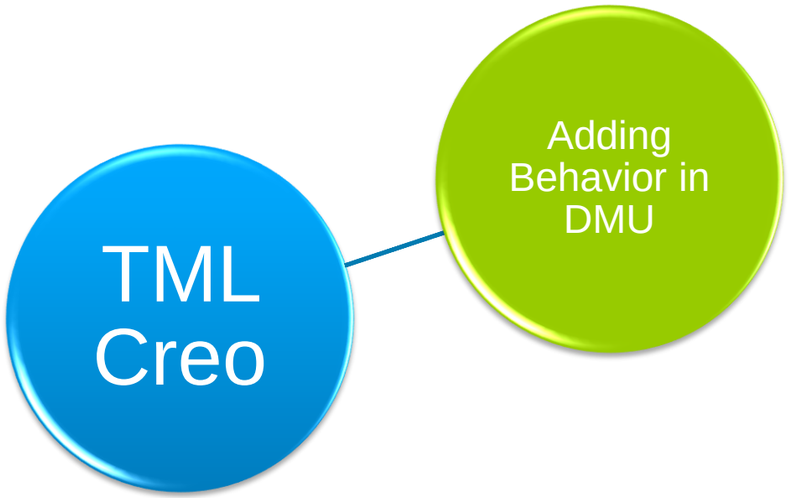
Creates model as per TML standards with necessary Part Parameters

PLM Database

- Reuse the required standard parts from PLM system to avoid duplication

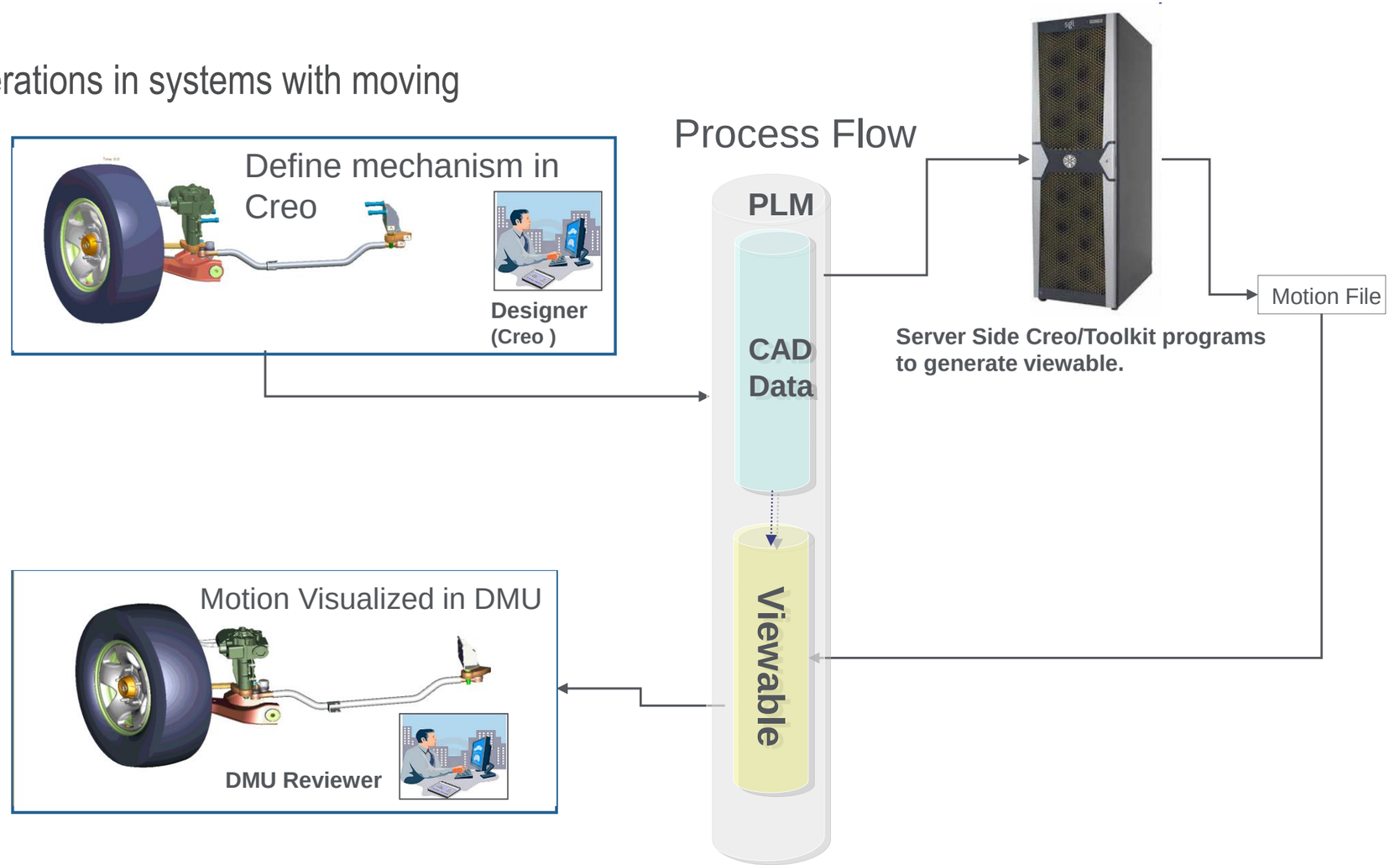


Innovative use of Creo for Digital Product Development



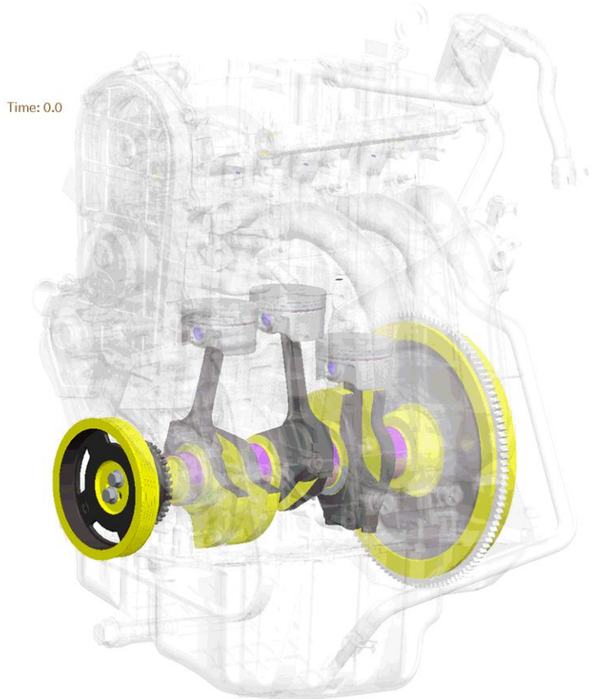
Adding Behaviour in DMU

- Creo Mechanism
  - Improve verification and validation process and maximize design confidence without the expensive burden of building prototypes.
  - virtually simulate the forces and accelerations in systems with moving components.
  - To visualize the kinematic motion in enterprise visualization tool.

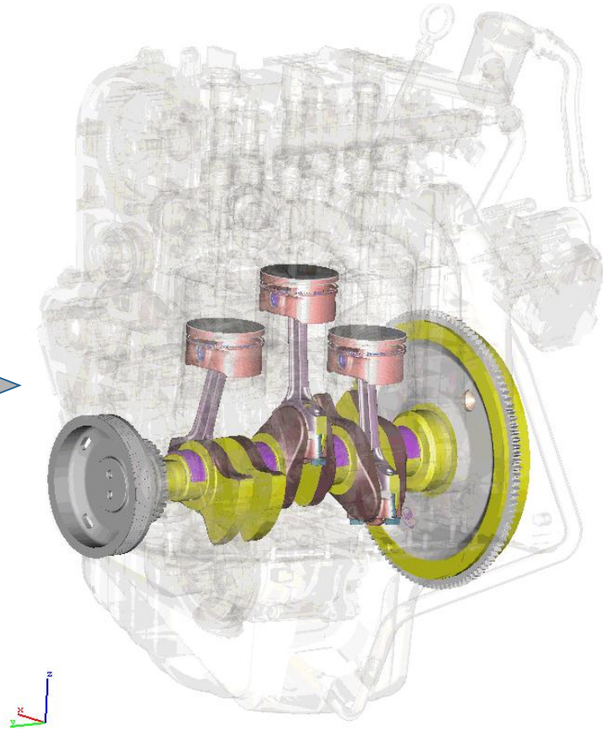


Adding Behaviour in DMU

- Complete behavior in Light weight format.
- Easy for handling motion results in visualization tool.
- Helps in vehicle packaging process and DMU checks.
- Seamless integration of Pro/Toolkit and Other Toolkit programs to generate motion file.
- Automated process and one step towards complete DMU.

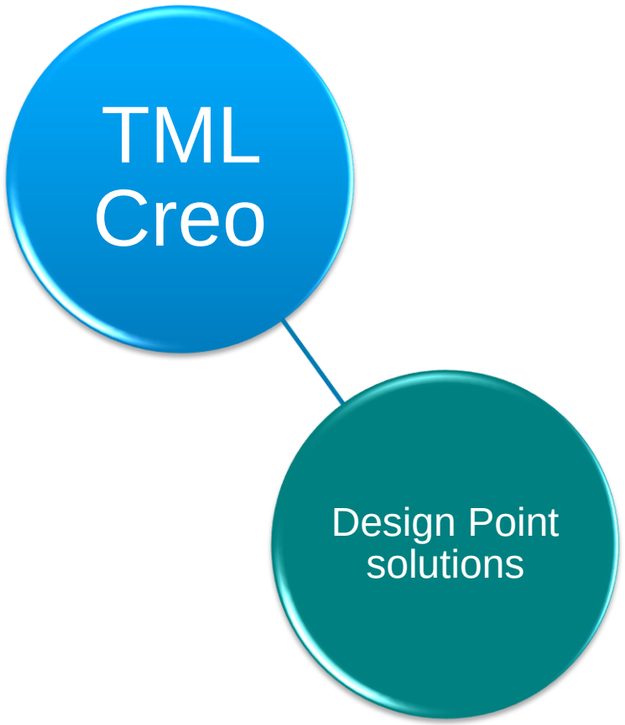


Creo Mechanism Definition



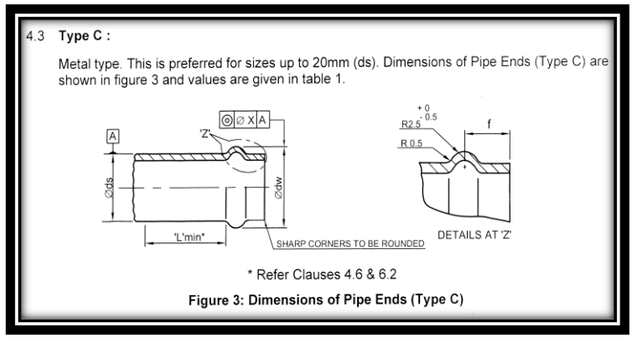
Reflect in Visualization DMU

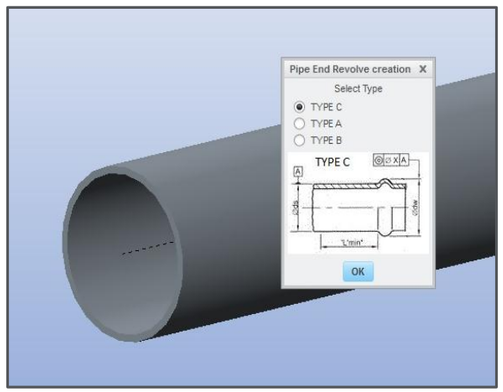
Innovative use of Creo for Digital Product Development

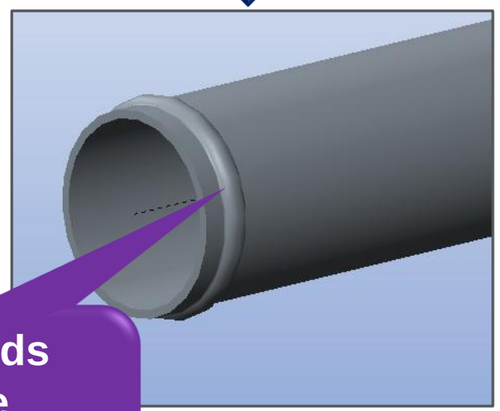


TML UDF Feature Library

TATA MOTORS STANDARD

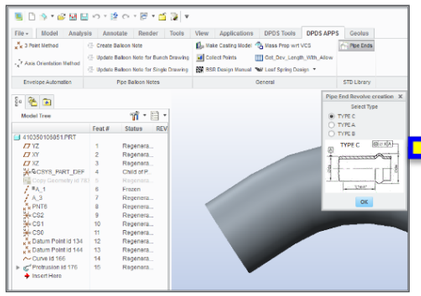






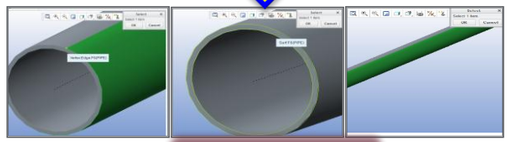
Pipe Ends create automatic as per TML STD

Start the Application and select Type



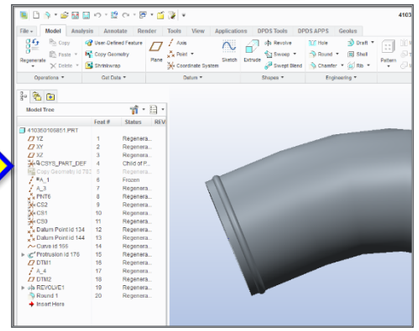
TS Standard database

TML Features Library



User Selection

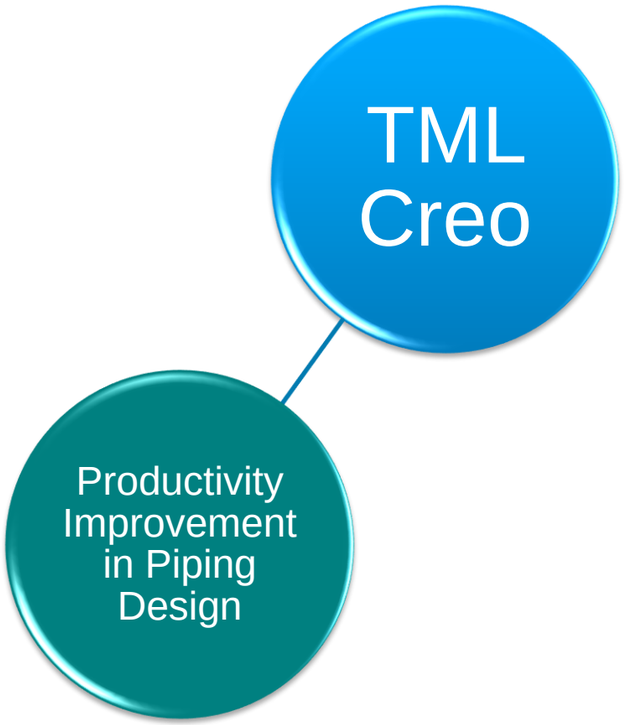
Features Created



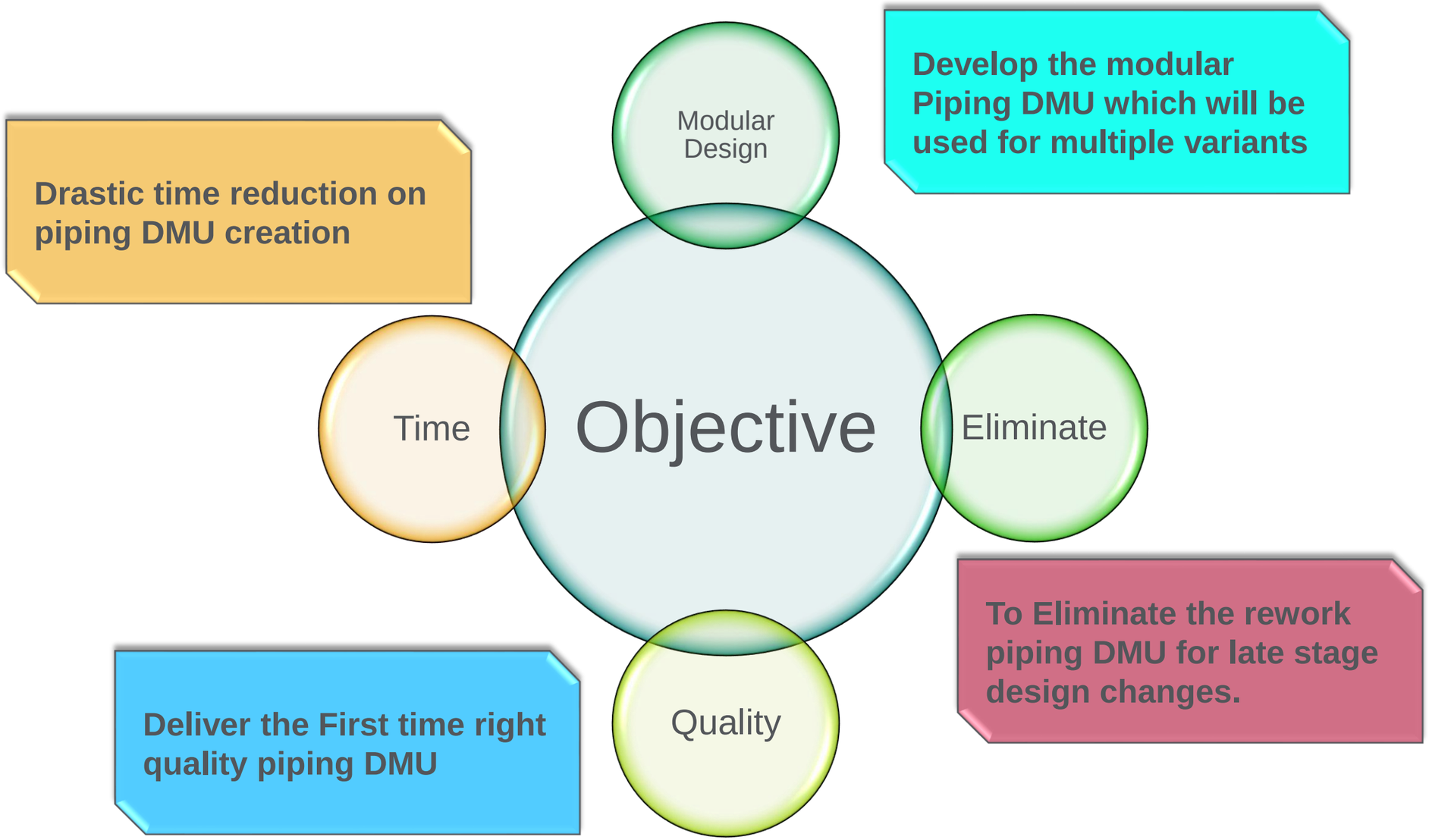
Advantages:

- **Readymade TML Feature Library**
- **Standard Design Process**
- **Quick and error free**

Innovative use of Creo for Digital Product Development



Piping Design Process Automation



Piping DMU Process Improvement

- Advance Pipe Methodology by follow axis, follow pipe process improvement
- Customized Single click Bunch Drawing and individual Drawing creation

- Modular Piping Template Piping DMU creation
- Multiple variants can be developed from one template
- Easy for modification and reusability of Existing parts

Piping Design and Drawing Automation

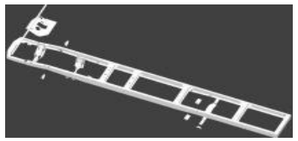
- Pipe Routing by Advanced Piping technology like Follow Axis , Follow Pipe.
- Light weight data for Reference Creation
-
- Automation in Bunch Drawing and Individual Drawing

Phase I

Modular Piping Design Process Drawing Automation and As procured piping process

- Piping DMU by Dynamic Reference Creation and Modular Design Approach
- Piping Template for vehicle configuration which be used for multiple variants
- Automation in IFD Drawing creation

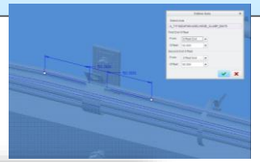
Modular **Piping DMU Creation**



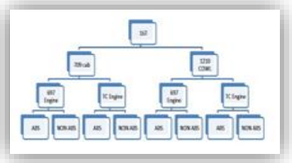
Aggregate Assembly
(All Vehicle Configuration)

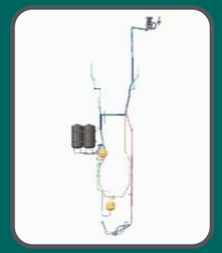
Clamp & Bracket Assembly

Bunch Pipe Assembly
By Advance Methodology



All Aggregate & clamps reference to VCS



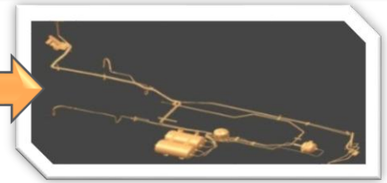


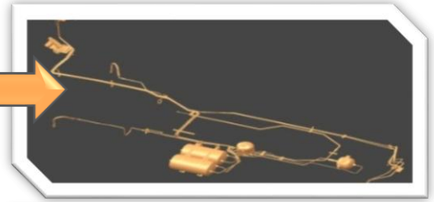
Modular Piping Template Model

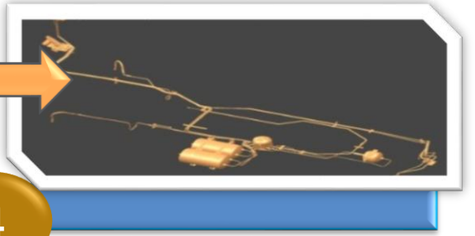
Pipe Bunch Assembly
For I variant (42 WB)

Pipe Bunch Assembly
For II variant (48 WB)

Pipe Bunch Assembly
For III variant (52 WB)







Follow Axis/ Follow pipe Piping Methodology

& Creo customization for modularity

1

Piping Aggregate Assembly Creation

- All Aggregate reference Creation wrt VCS

2

Piping skeleton Model and fitting Assembly Creation

- Clamp and cable tie positioning wrt VCS
- Chassis skeleton model independent.

3

Piping DMU Creation

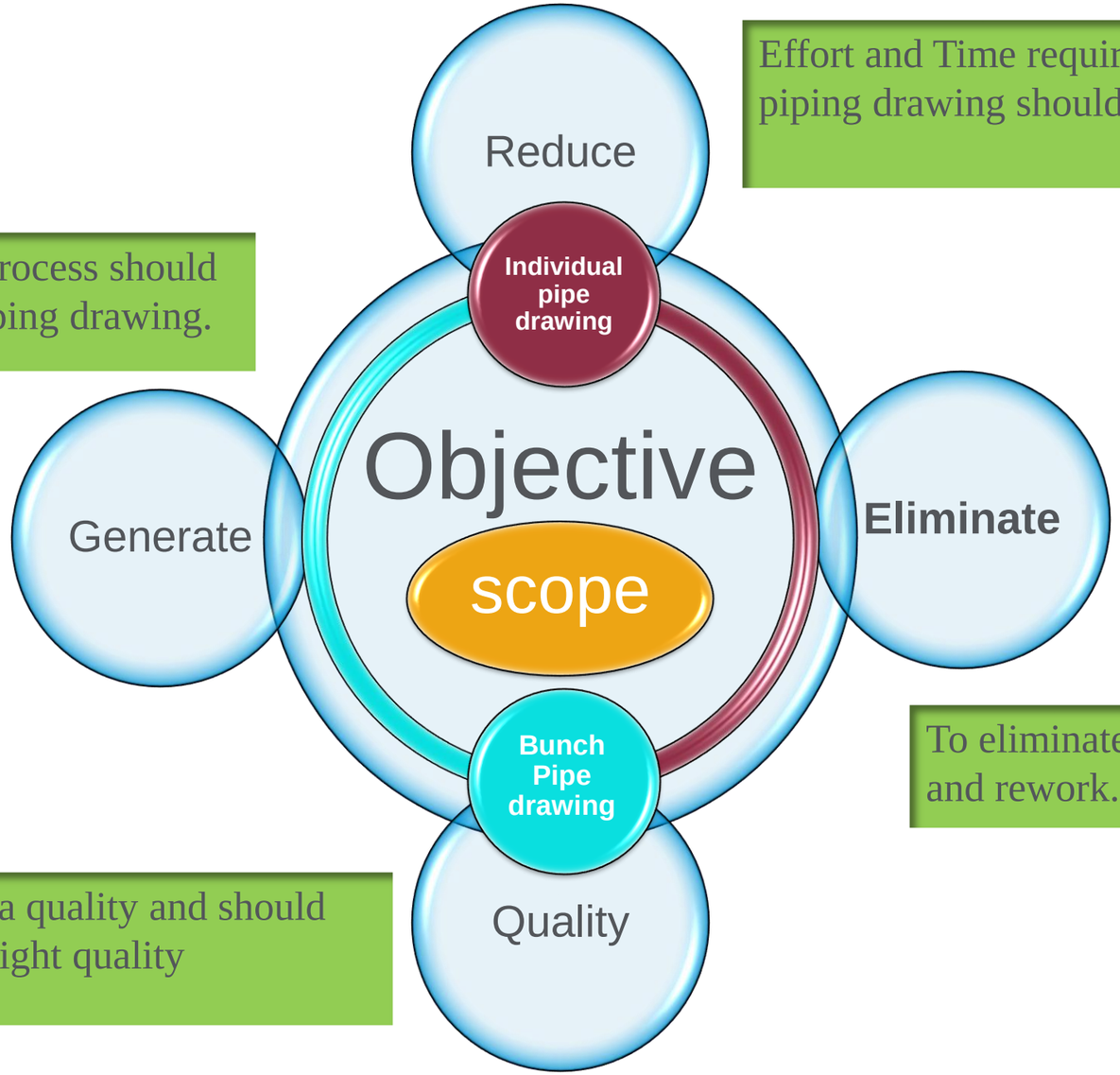
- Bunch Pipe Assembly Creation using advance Piping methodology.
- Modular Piping Template design

4

Piping Drawing Creation

- DPDS Tools used for Bunch and Individual Drawing Creation
- DPDS Tool for automatic IFD Creation

Piping Drawing Automation



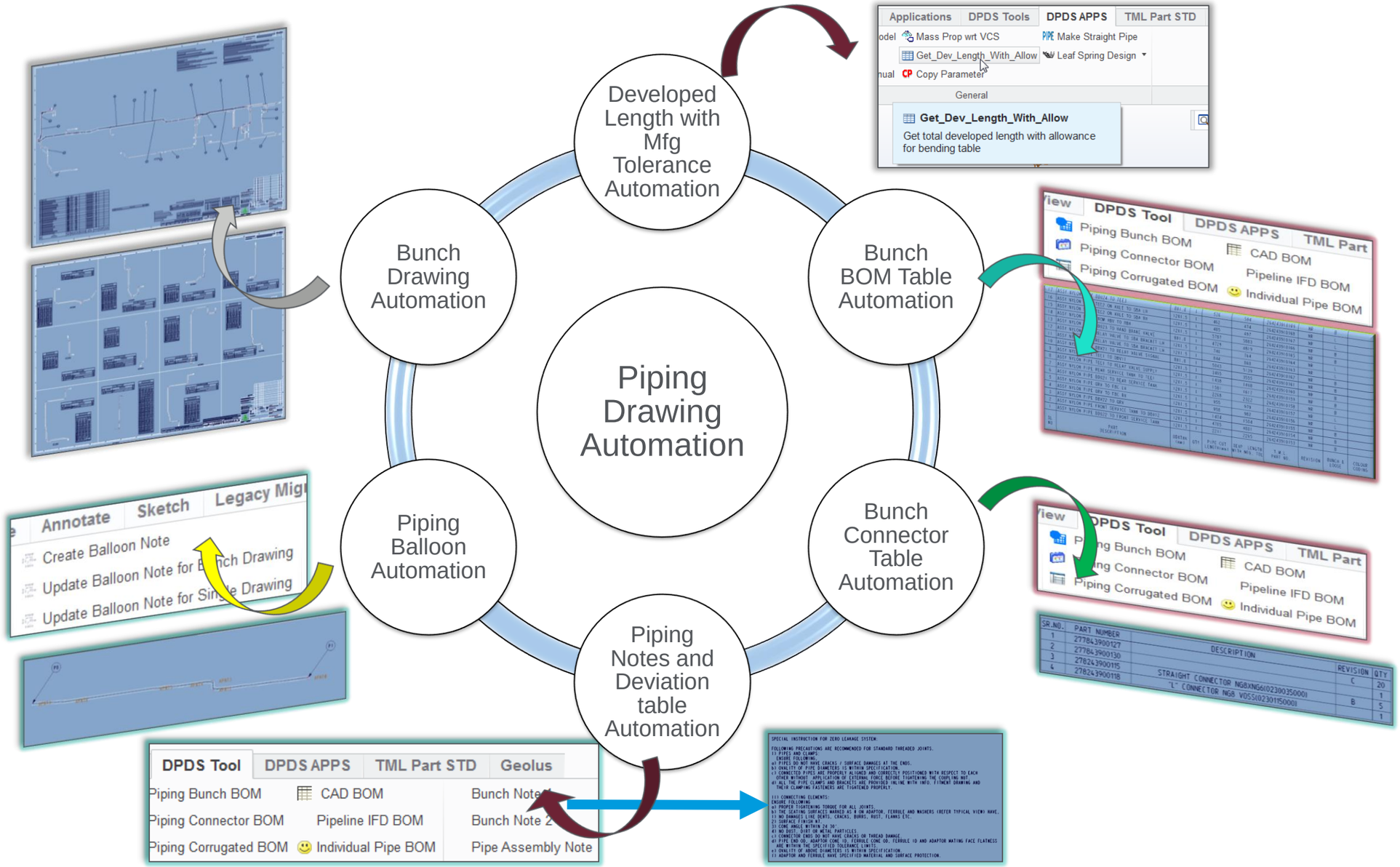
Effort and Time required to create piping drawing should be reduced.

Unique Standard process should be available for piping drawing.

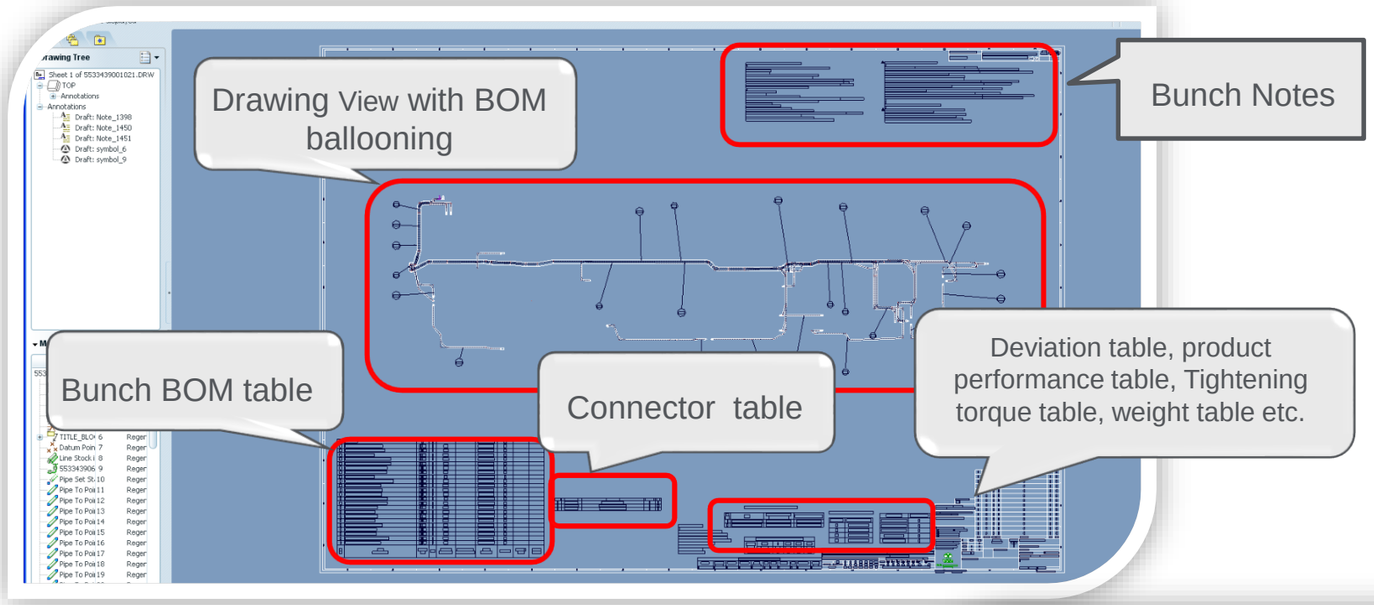
To eliminate manual errors and rework.

Enhance the data quality and should give First time right quality

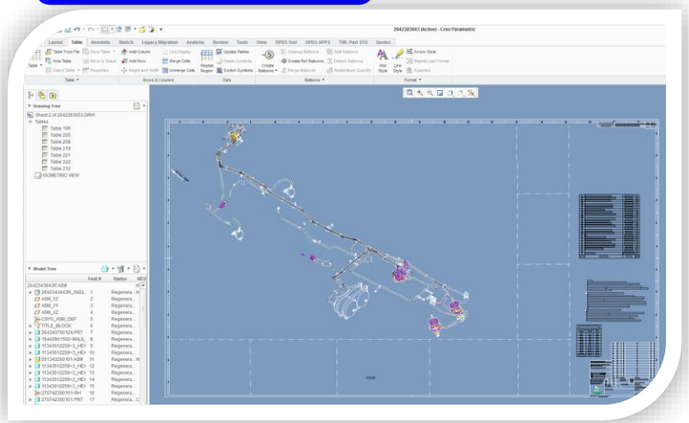
Piping Drawing Automation



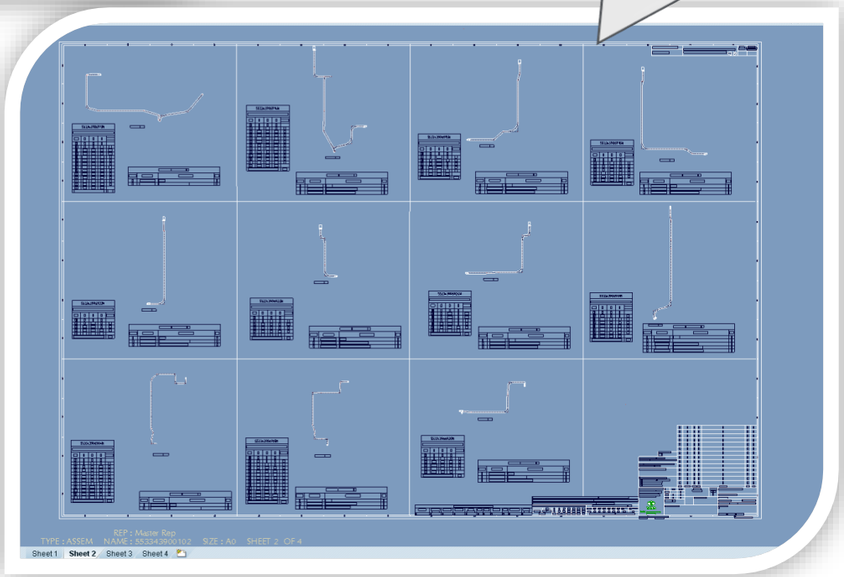
Bunch Drawing & IFD Creation through application



Automatic created IFD



Created Individual pipe drawing with Bend table and BOM table.



Summary

- Usability of Creo can be further enhanced by means of mapkeys, custom menus and Pro/Toolkit applications.
- Using design rules and material database & Pro/Toolkit we can create parametric feature based geometry which can be leveraged for various downstream applications.
- Digital mockup with proper behavior helps to reduce overall product development time.
- Productivity enhancement with process improvement using Modular Piping design methodology and Toolkit based Automation.
- This innovations reduced more than 40% design cycle time and helps organization to make decision faster.
- It helps to achieve company's objective of first time right quality also helps in late stage design modifications.
- Ability to make standardize your design data as per the industry standard and flexibility in exchanging information across system.
- Apps developed using Pro/Toolkit API reduced the work drastically.

Thank You

Mr. Tushar Gadhave
June 9, 2015

TATA Motors Limited

PTC® Live Global

PTC® PRODUCT & SERVICE ADVANTAGE®