

SystemDeveloper



AIES Ltd's new concept - *SystemDeveloper*

allows developers, engineers and designers to build, their own design and analysis systems. It enables them to build solid models and solid model assemblies that capture their companies IPR, knowledge and physics . It enables them to use best in class analysis methods by interfacing with solvers such as Abaqus, Ansys , Nastran and CFX , whilst at the same time capturing their own unique design and analysis methods. This may include the capture of manufacturing, assembly and loading methods. Loading methods may include thermal, mechanical, fluidic and electromagnetic. The analysis methods can be analytical or numerical such as FE, FD, FV or BEM.

Building a machine model

For a long time we at AIES have recognised that the key to building and analysing machines are bearings, that is why AIES Ltd has its own unique Tribology solvers to enable you to build machines much more easily than can be done by conventional CAD and CAE methods. We have solvers to simulate mechanisms, gears, pistons, cams, tappets, big end bearings, squeeze film dampers which are easily integrated into any system built by SystemDeveloper. Our unique solid modelling and building methods means we guarantee that if you can build it, it will be automatically hex meshed. Something CAD and CAE vendors would like to boast.

Unique solid modelling

Our unique solid modeling methods automatically generate principal geometric attributes (dimensions) as you build the solid. These can be used for optimization studies (such as robust design), scaling of the solid and mesh control targets. The outside surface of the solid and what we call outline is generated automatically as you build the solid and can be used for condensation, BEM meshes, contact surfaces and retrieving results.

Unique meshing methods

Our unique meshing methods enable best in class refinement technologies for biasing of mesh around a kt feature for example. This meshing technology is also applicable for CFD applications as we are able to apply boundary layer elements very easily by the click of a button. Refinement of the mesh simply cascades through the model instantly in front of your eyes.

Best of both worlds

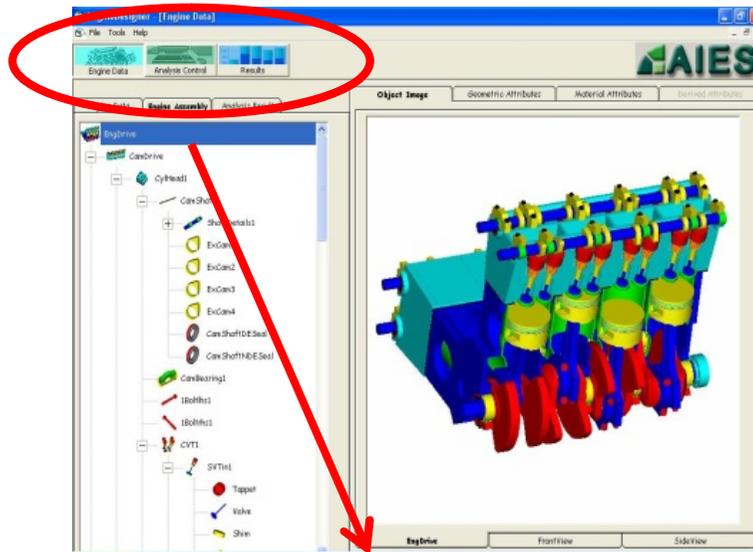
The environments built by SystemDeveloper allows the design engineer to have both the solid model and the hex mesh at his disposal for optimisation, he does not have to bounce between disparate programs, and find someone has taken one of his licences at crucial moment. Our new approach to design, analysis and innovation truly opens up new avenues for the engineer and his company.

Too good to be true?

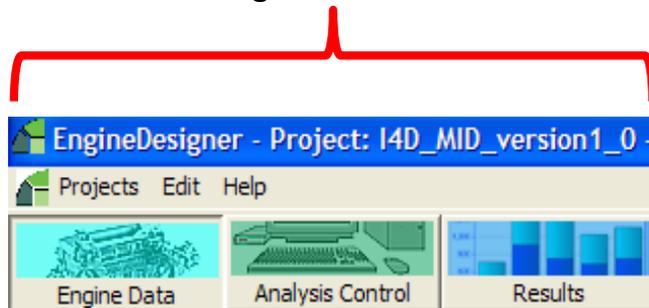
Is this too good to be true? Why not contact us and find out how CAE has just got a whole lot more interesting for you, your boss and your company's future. Don't get bogged down with PLM take control of your design process. Give us a call on +44 (0) 1858 414854.

SystemDeveloper

1) Building systems like **EngineDesigner** with our new **SystemDeveloper**



Design Environment



EngineDesigner has 3 distinct Trees

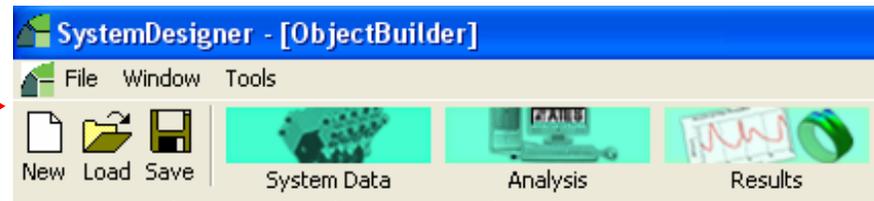
- 1.Data Tree (LHS)
- 2.Analysis Tree (middle)
- 3.Results Tree (RHS)

It is the aim of **SystemDeveloper** to build instances of **EngineDesigner** or any other ***Designer** system come to that.

We have demonstrated **TurboDesigner** results of FFB and PGB instability and unbalance response.

2) **SystemDeveloper** also has 3 distinct design trees, see below. **SystemDesigner** also has 3 more distinct trees.

See overleaf for more details.



SystemDeveloper-Environment

Design Environment



Building Environment



Building Environment – 3 distinctive building trees

1. Library Tree

1. Solver Type (OEM)
- CAE Event Tree
2. Solver Licences
3. AIESL Solvers
 1. Bearings
 2. Contact
4. Object Library
5. Object Assembly Library
6. Properties Library
 1. Fuels
 2. Lubricants
 3. Fluids
 4. Materials

2. Object Builder Tree

where finite object assemblies and objects are built

1. Finite objects are 2D and are manipulated by various operations to become 3D FOs and FOAs.
2. The Finite Object Assembly FOA is part of an object as it has its connections open.
3. An Object has no connections open and has interfaces for connecting to other objects
4. These FOAs and FOs and Os can be saved at any time, to the user area or the library.

3. System Builder Tree

This is where objects are connected together for assemblies and systems

1. Objects are connected together via interface objects (bearings etc.) to make assemblies and systems
2. The CAE Event Tree is generated from a list of methods and analyses.
3. The order of this Tree mimics the physics and work flow.
4. Results Tree is built by following choices of results type, 2D line or 3D graphics
5. Save as a design environment

Knowledge Based Systems – what they offer



Company knowledge capture

- Design & R&D processes captured

Standardisation

- Design and analysis processes

Reusability & flexibility

- Allows building of new objects, system templates and methods

3D modelling

- Provides the mesh as a bi-product of abstraction choice

Object's principal geometric attributes are automatically generated

- Drive automatic geometry changes

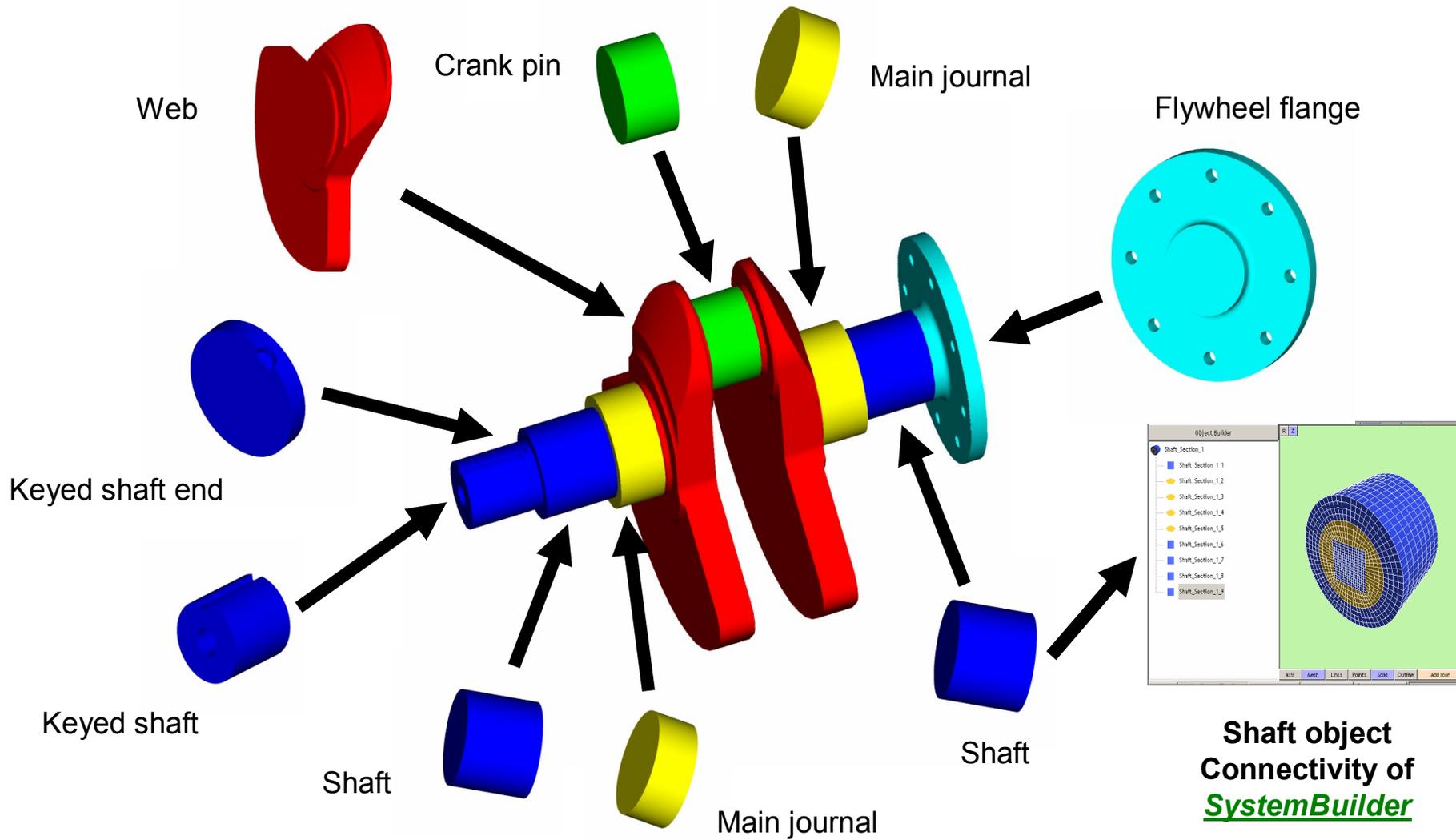
Design iterations

- Capture design and analysis history
- Capture design evolution

Results comparisons

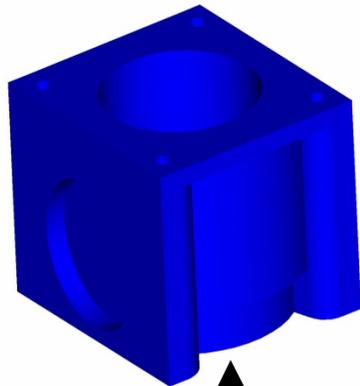
- Compare test, with predictions and targets

Concept of reusable objects

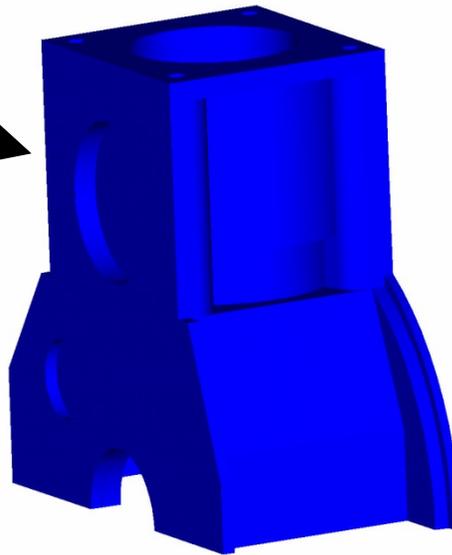


Concept of reusable objects

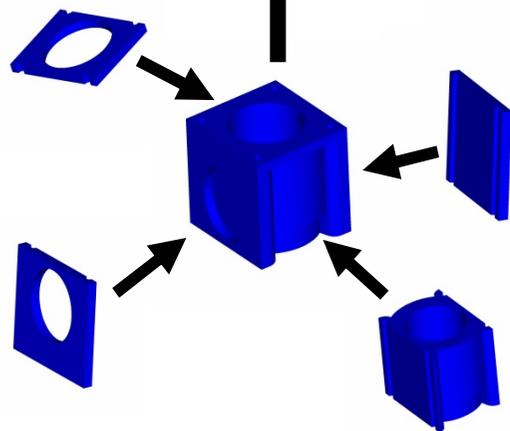
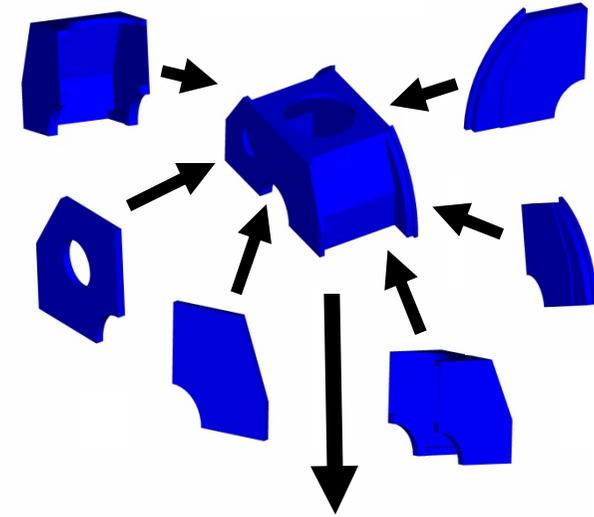
Cylinder Case Object



Cylinder Block Object

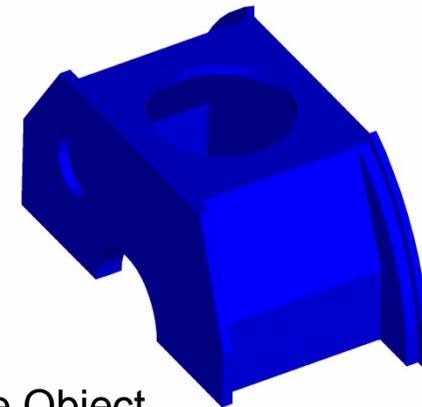


Reusable Meshable Objects

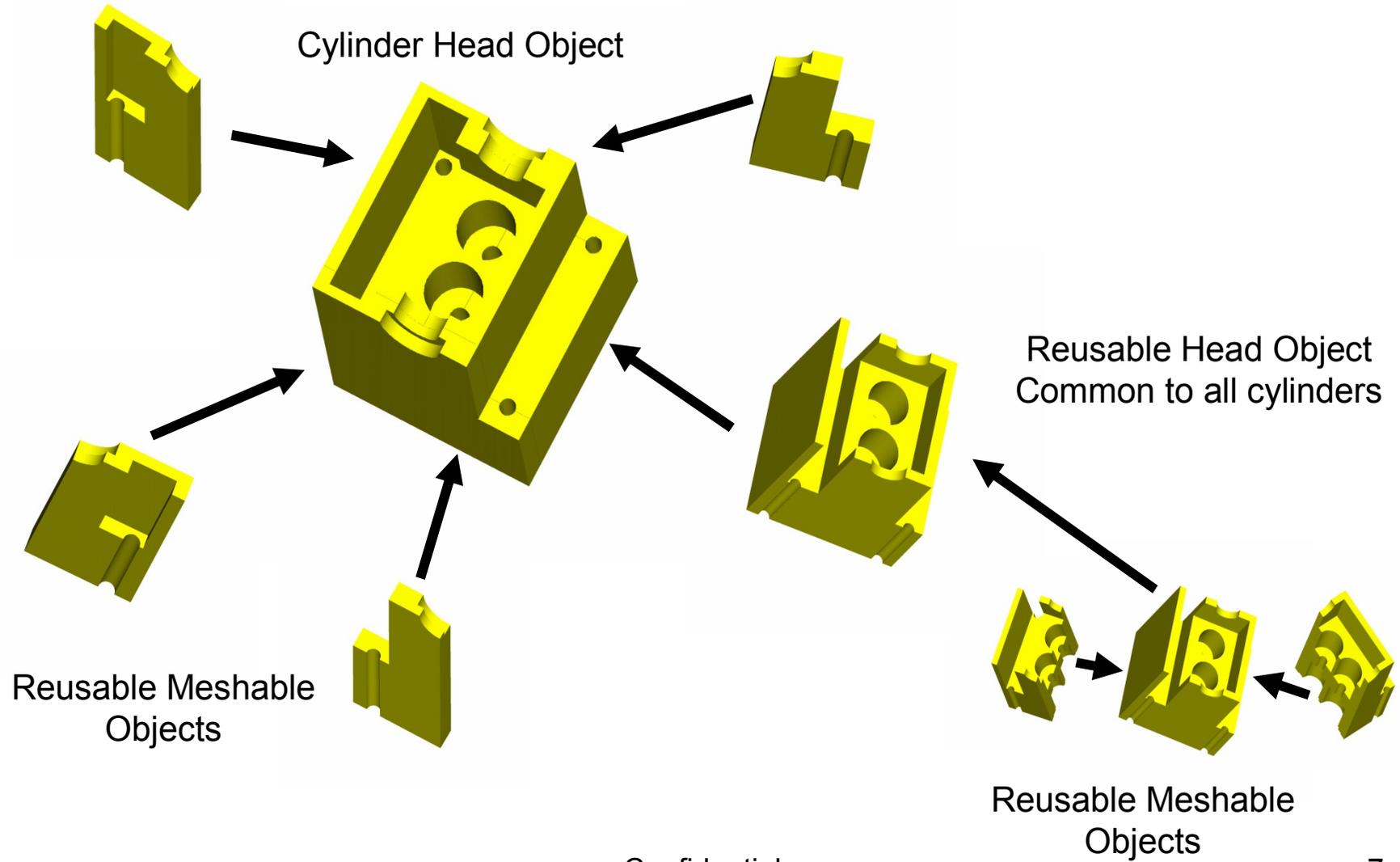


Reusable Meshable Objects

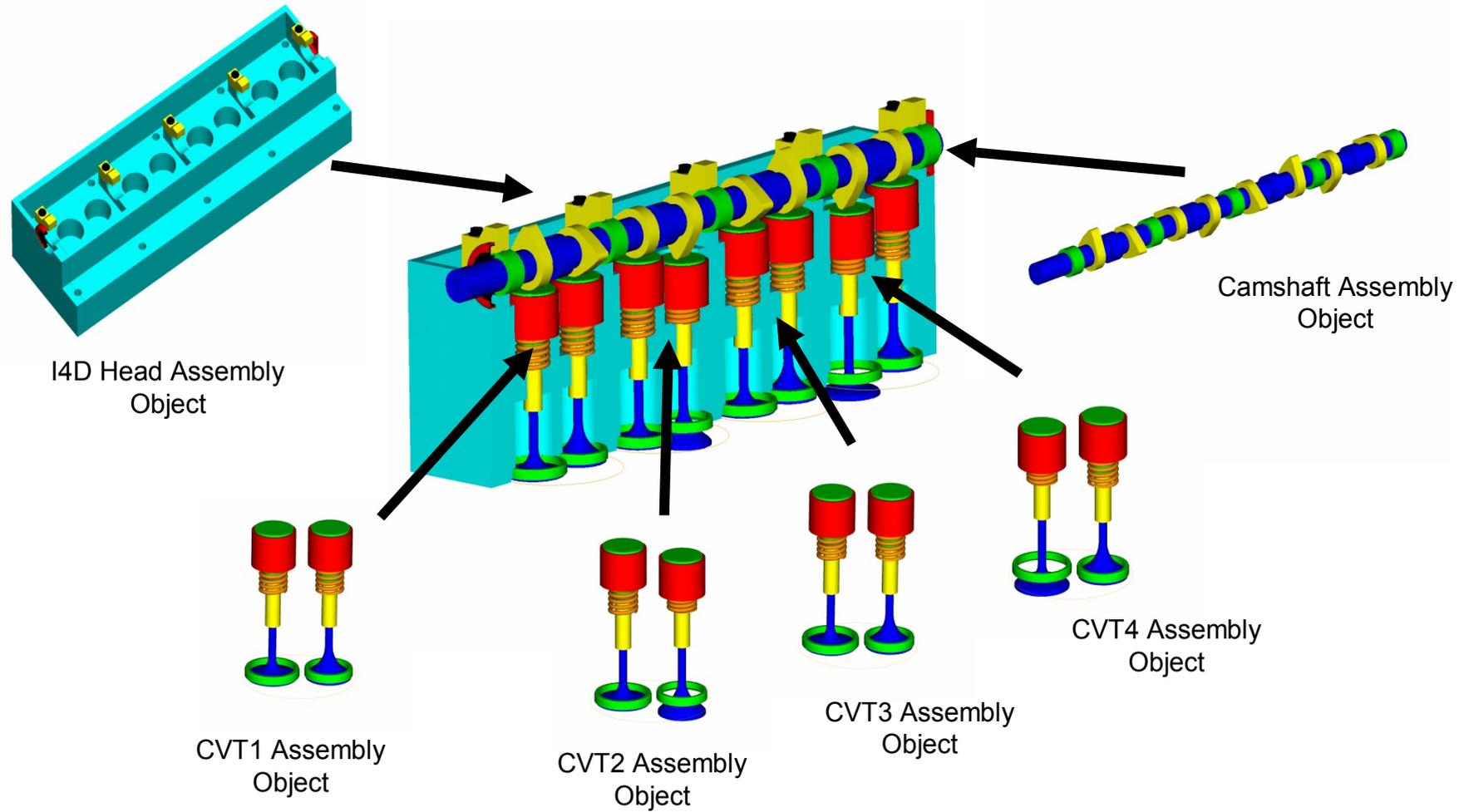
Crank Case Object



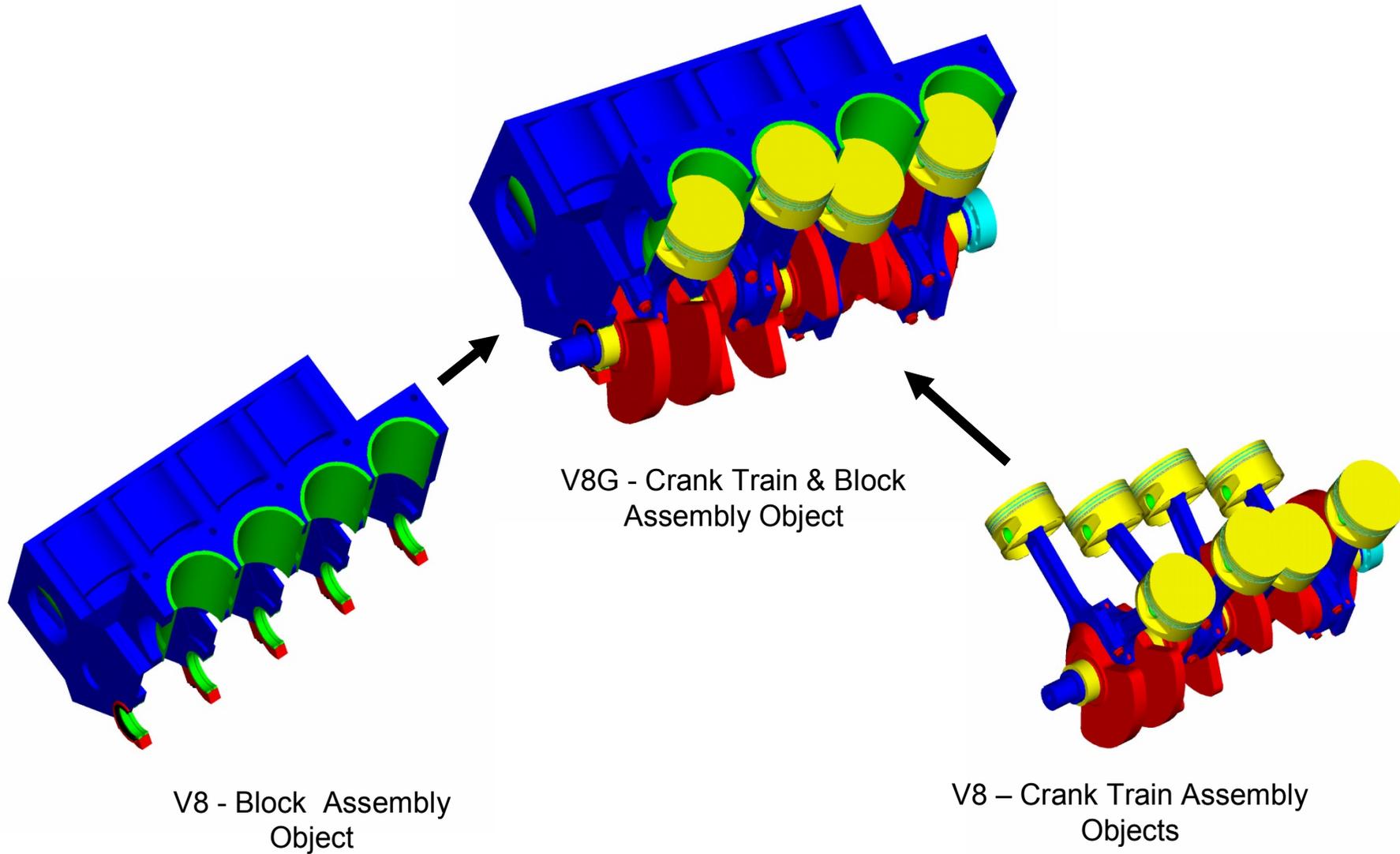
Concept of reusable objects



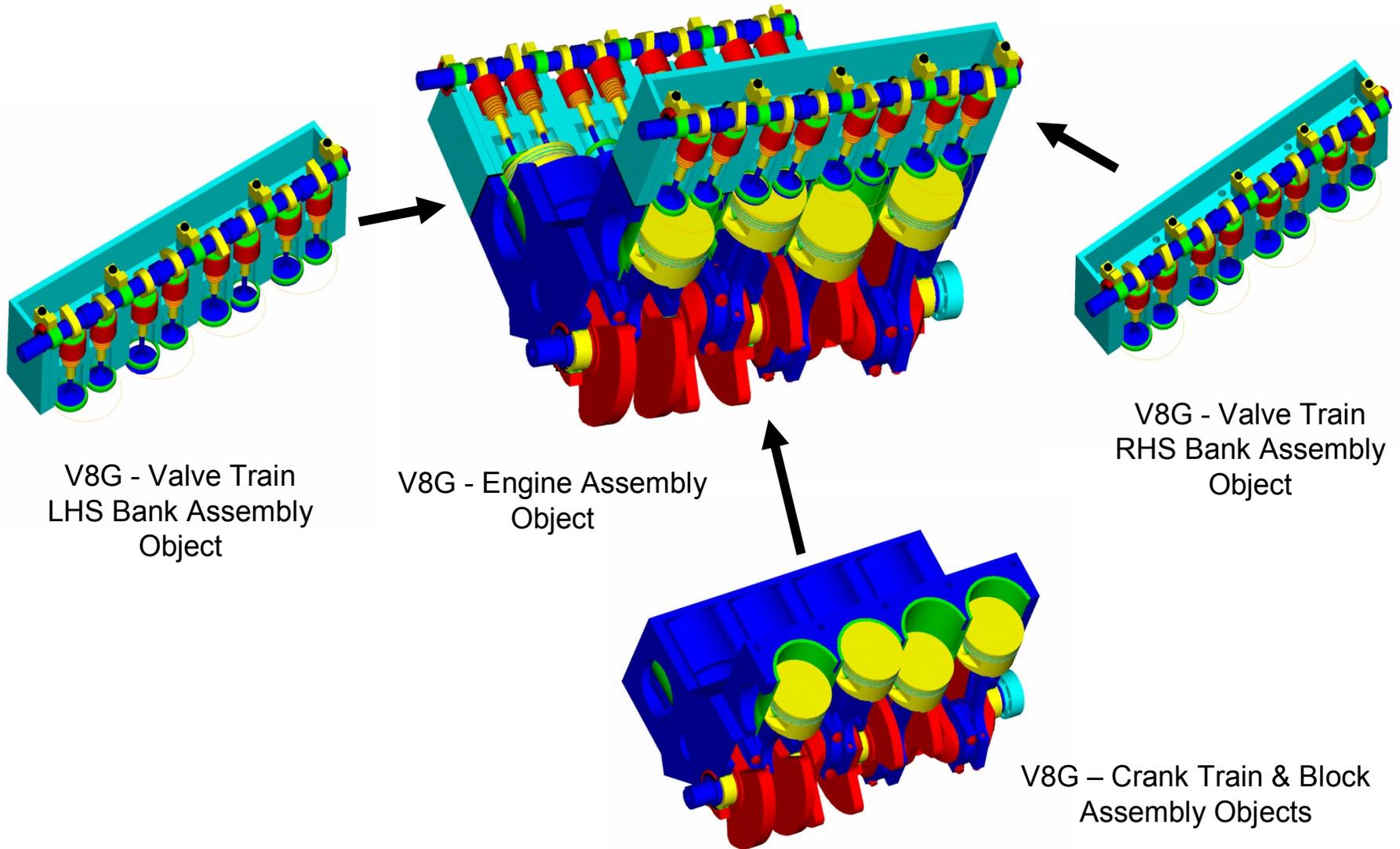
Concept of reusable objects



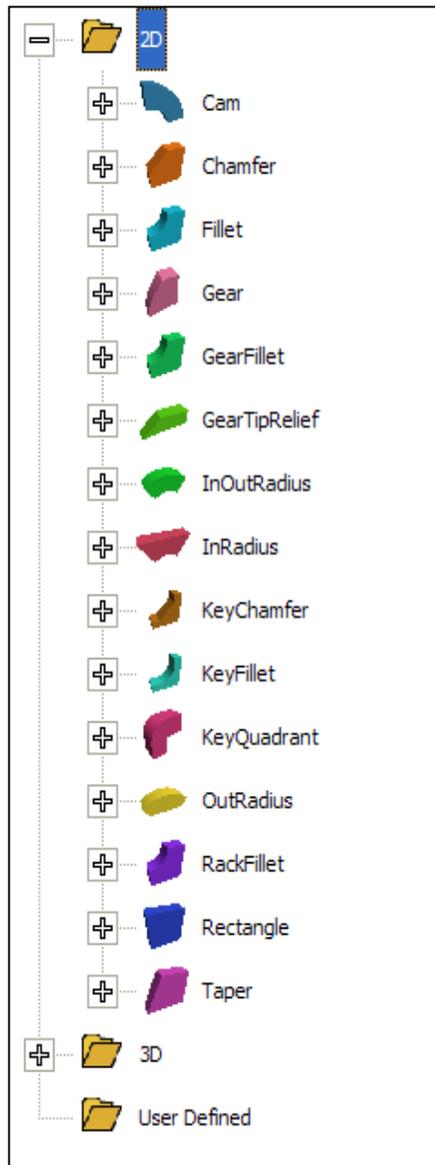
Concept of reusable objects



Concept of reusable objects



The basic building blocks – Finite objects



Library of finite objects

Can be any shape and any number of sides

- Cam, gear, fillet etc.
- 2D or 3D

FO's are described with interfaces and connections

- Interface is a public connector
 - To other objects via interface objects
 - E.g. Oil films and contact.
- Connections are private connectors
 - Pass data
 - material
 - geometry
 - mesh

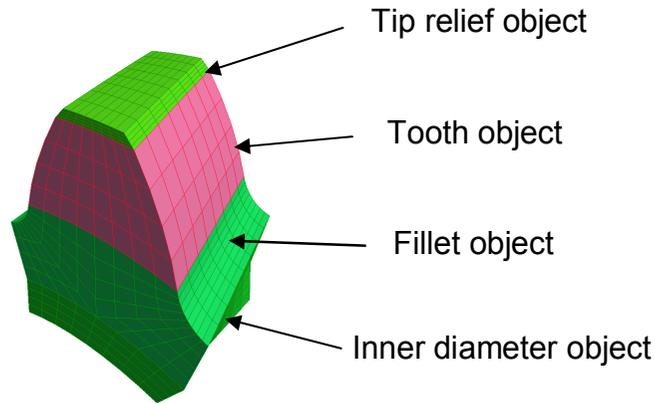
Manipulated by 3D commands to form solid objects

- Gear teeth, gear assemblies, tappets, liners, and con rods etc.
- Mesh fused with the solid.

When passing the model along for the next process

- Both the geometry and mesh can be changed by the analyst
- **In the same environment**

Basic building block – Finite objects



Building tooth and gear objects

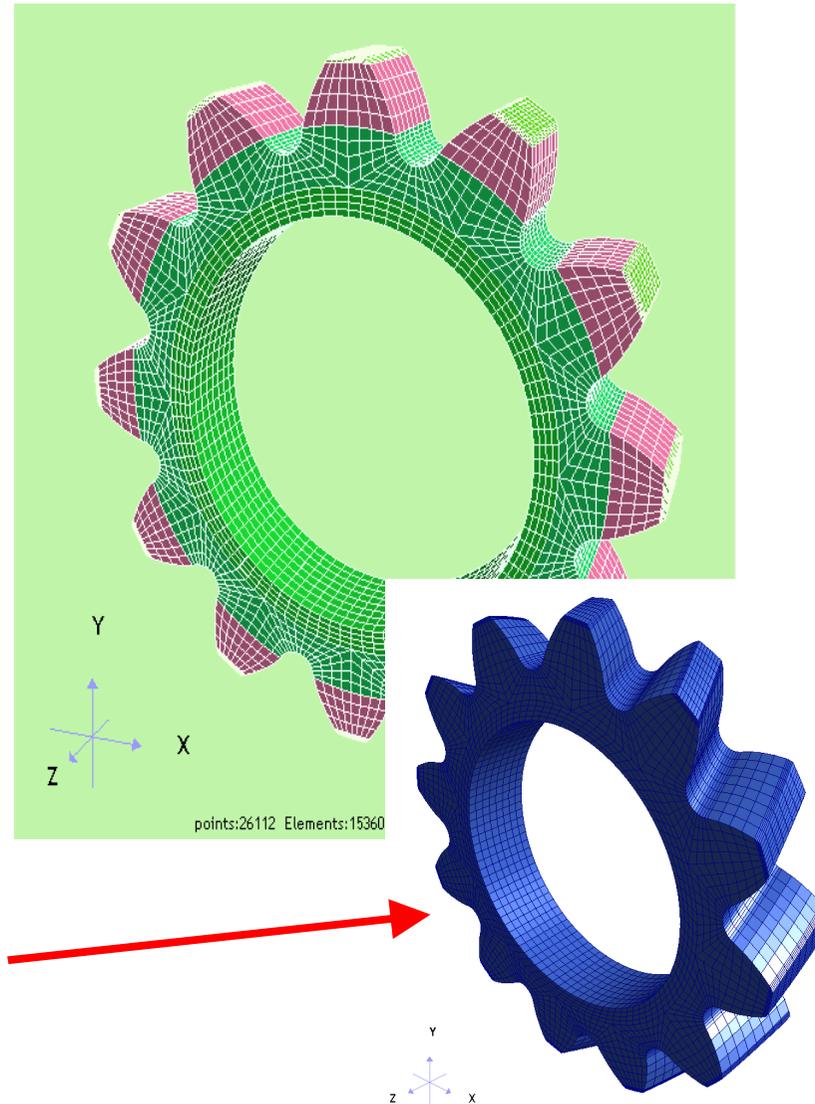
Gear tooth assembled from

- Tip relief object
- Tooth object
- Fillet object
- Inner bore object

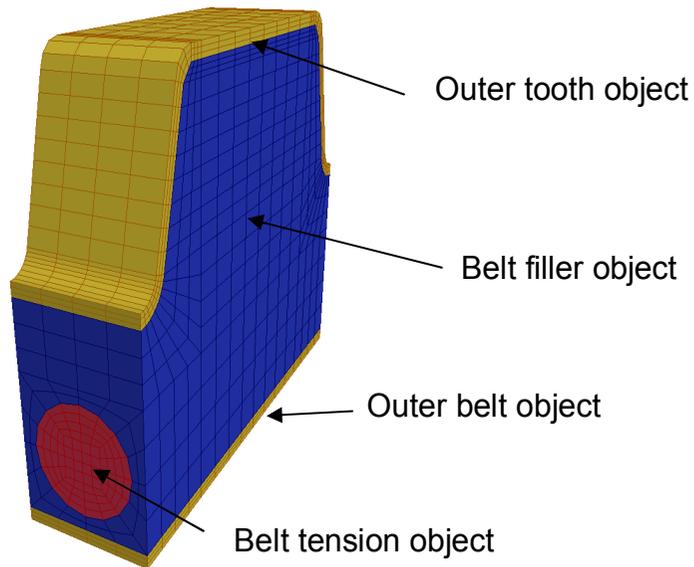
To form tooth object

Transformed easily to a helical gear

Gear assembly formed by connecting tooth objects together



Basic building block – Finite objects

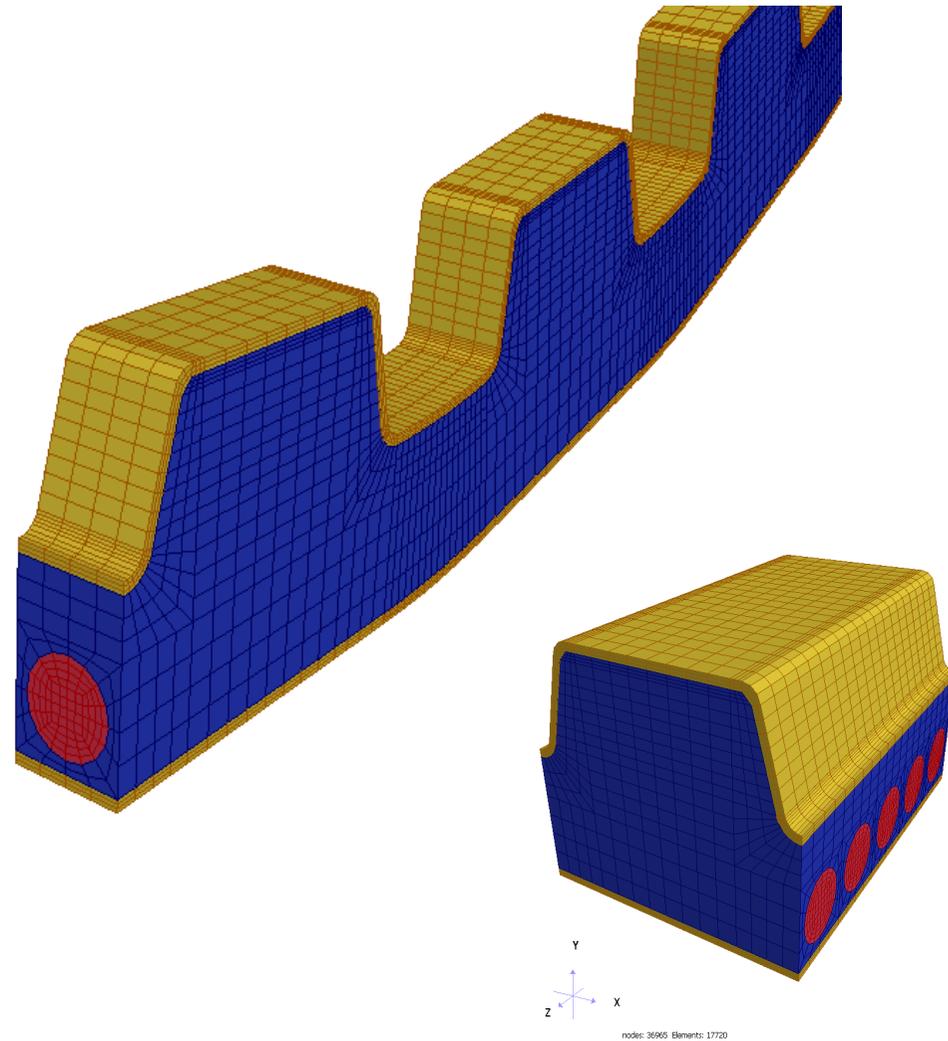


Building tooth and belt objects

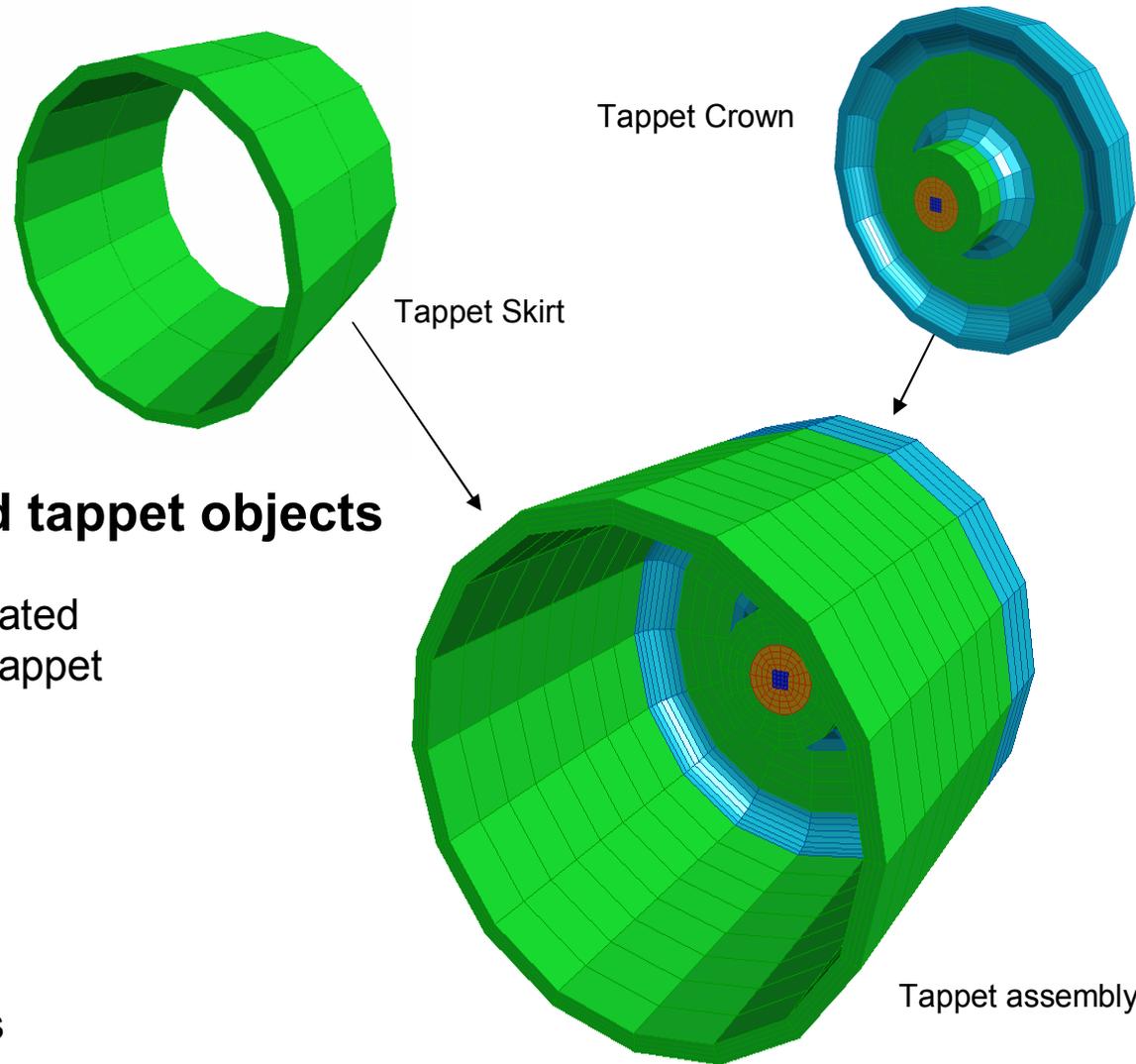
Belt tooth assembled from

- Outer tooth object
- Outer belt object
- Belt tension object
- Belt filler object

Belt assembly formed by connecting tooth objects lengthwise and sideways



Basic building block – Finite objects



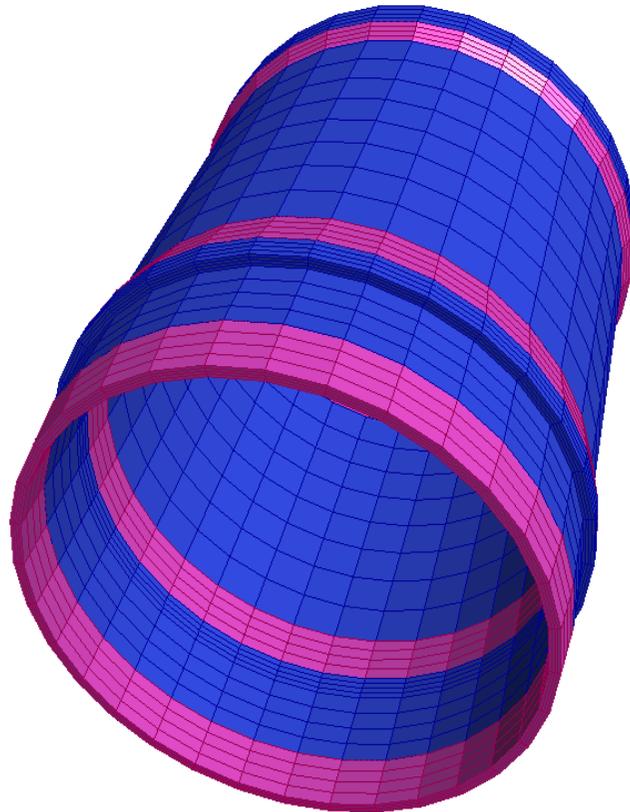
Building crown, skirt and tappet objects

Tappet Principal Attributes generated automatically whilst building the tappet

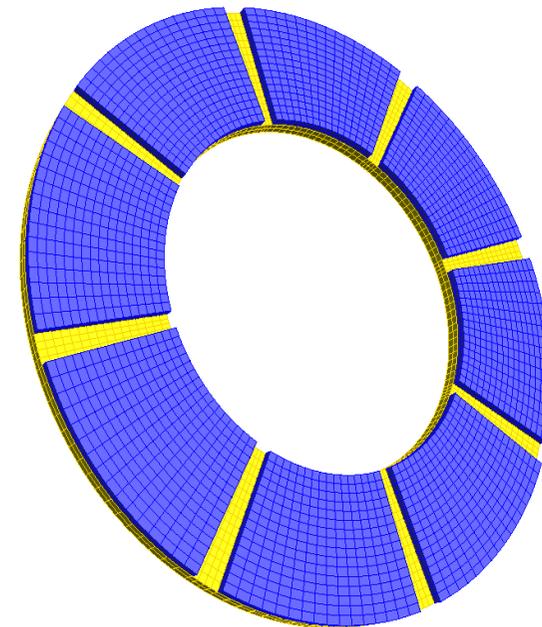
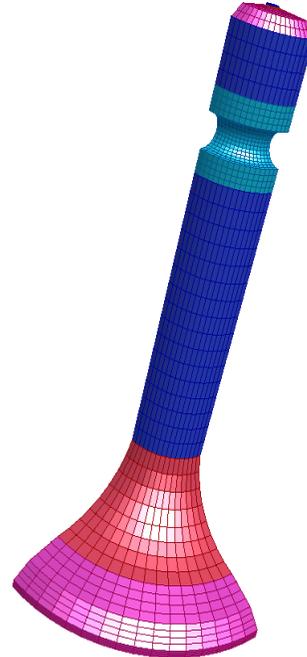
- Outer diameter
- Overall length
- Crown thickness
- Up stand length
- Up stand diameter
- Up stand fillet radius
- Crown internal fillet radius

Basic building block – Finite Objects

1/4 of poppet valve



Cylinder Liner with 18 principal attributes

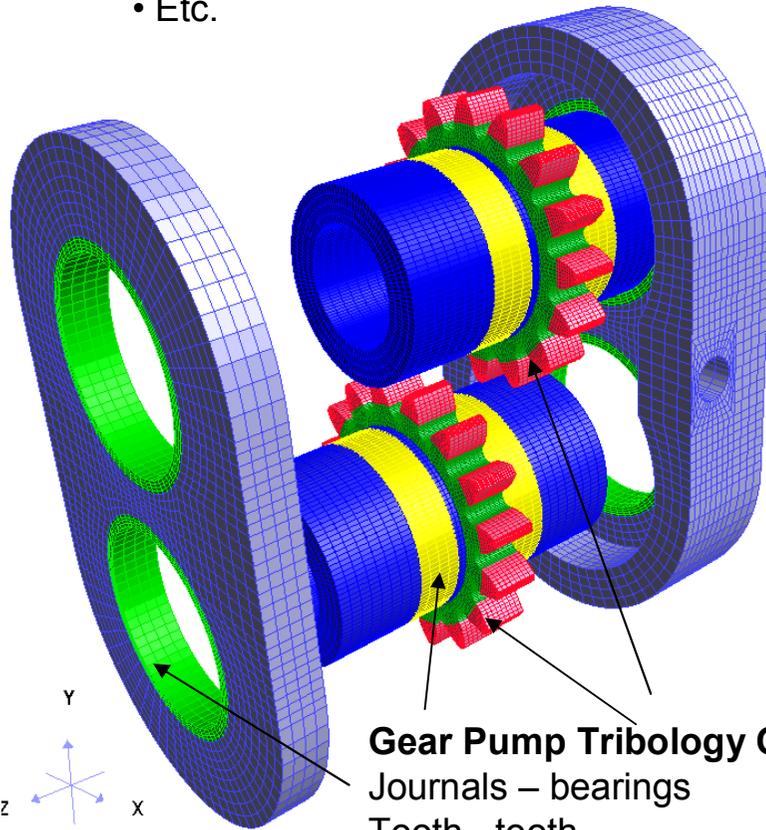


Thrust bearing with separate substrate and backing materials

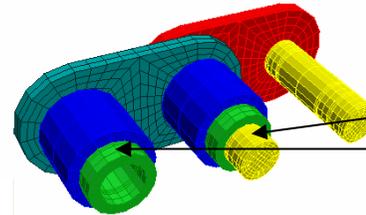
Object Assemblies – Tribology & Contact

Tribological Interface objects

- Journals – bearings
- Pins – bushes
- Bushes – rollers
- Tooth – tooth
- Etc.

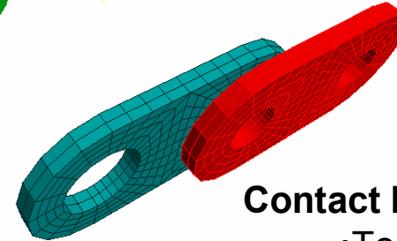


Gear Pump Tribology Objects
Journals – bearings
Tooth - tooth



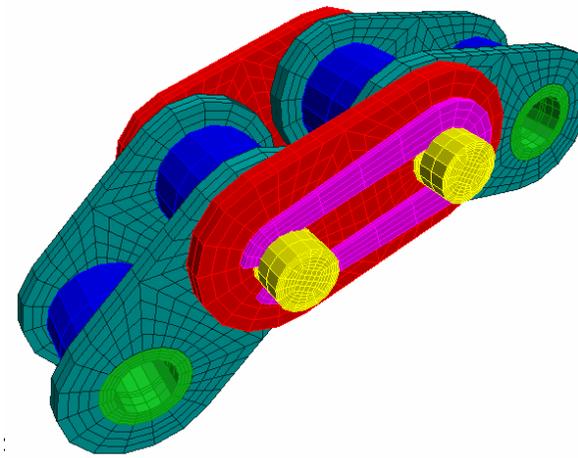
Chain Tribology Objects

- Pins – bushes
- Bushes - rollers



Contact Interface Objects

- Tooth – tooth
- Pin – sideplate
- Circlip – pin & sideplate
- Sprocket tooth - roller



Program screen shots – Tribology & Contact

