

# Large assembly handling in Pro/Engineer @ Tetra Pak

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WORLD  
EVENT.  
2005

**NORDICS**

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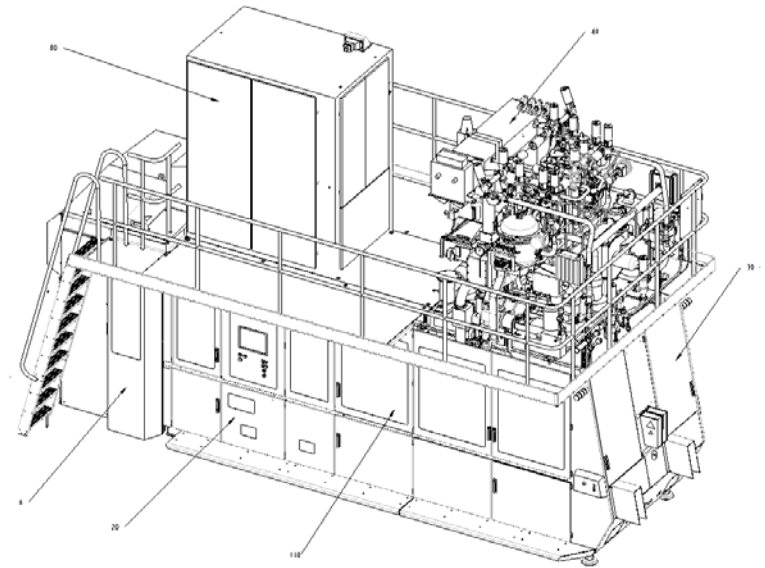
# Agenda

~ 30 min

- What is a large assembly?
- Application areas
- Large Assembly Approach @ Tetra Pak

~ 15 min

- Tips & Tricks & General good practice



# What is a large assembly?

## A large assembly...

- has more than XX (unique) parts and YY subassemblies
- take more than XX minutes to load
- take more than X GB of disk-space
- consumes more than X MB of RAM-memory
- take more than XX minutes to check out from Intralink
- ...

**No such definition exists! All above correct.**

Tetra Pak rule of thumb: Large assembly > C-group

# Symptoms

## Graphics

- Repainting of screen takes forever
- Viewing and navigation is almost impossible

## Time

- Regeneration
- Retrieval in Pro/E
- Check-out from INTRALINK (>1 hour)

## File-size (on disk)

## RAM memory

- Pro/E OS memory limit



**Most critical**

# Operating System

## Windows single process limitation

### Win32 + Pro/E 32bit

- XTOP limited to  $\approx 1,7$  GB

### Win32 + "tweak" + Pro/E32

- XP tweak  $\approx 3$  GB

<http://support.microsoft.com/kb/316739/EN-US/>

<http://support.microsoft.com/default.aspx?scid=kb;en-us;Q319043>

- Physical memory (RAM) > 2GB recommended

### Win64XP + Pro/E64 (from M160)

- 18.4 Billions GB theoretical limit for 64-bit system!



**Tetra Pak 2005**

# Application areas

# Application areas

## Drawings

- Safety Sign drawings (legal requirement)
- Installation- and "footprint"-drawings

## Simulations

- Mechanism, Mechanica etc
- Interface and interference checks (B-group to B-group)

## Visualization

- Rendered images
- Real-time renderings

## Other



# Background



# Background

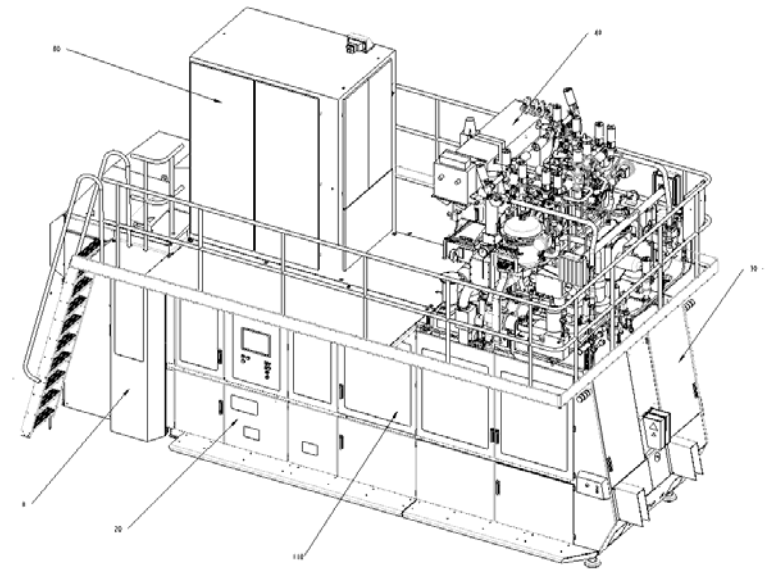
## Tetra Pak Machine

Part Count >10 000

Part # Count > 5 000

Typically           5-7 B-groups  
                          8-12 C0-groups  
                          5-15 C1-groups  
                          3-5 C2-groups

Yields ~ 2000-3000 Pro/E assembly-files



## Mechanical Designers

~ 450 active Pro/E users

~ 20 independent design teams with total responsibility

# Large Assembly Method -LAM

# Toolchest

- Family tables
- Interchange groups
- Accelerator files

Variant  
handling

- Layout
- Envelope
- Zone

Top down  
design

- Substitute
  - Simplified representation
  - Graphics representation
  - Geometry representation
- Reduction of necessary  
information

- Skeleton
- Copy geometry
- Publish geometry

Top Down  
Design

- Inheritance features
- Snapshot drawing views
- Drawing view manager

Detailing

- Component display
- “dumb” parts
- Shrinkwrap
- ...

Memory  
reduction

# Large Assembly Approach

## Combined Top Down / Bottom Up

### **Simplified rep (Bottom up)**

- Definition rules to filter and reduce complexity

### **Shrinkwrap (Bottom up)**

- Associative
- Surface subset
- Defined on C-level

### **General structure (Top Down)**

- Parallell "help assembly" used to define and control assembly structure
- Template for variant handling

### **Interchange groups (Top Down)**

- Container for variants and lightweight groups

# LAM cont.

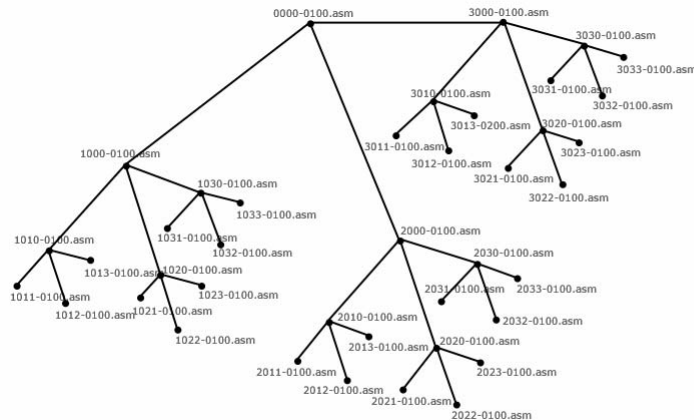
## OPGL- Operational Guidelines

### Work with lightweight structure

By working with a general structure and placeholder technique, it is possible to control the final assembly with only reference parts loaded. This is not need to be in session. The key to this is to use a simplified representation called 'No\_Geometry' which only have the reference part in master

There are several situations where this can be applied:

- Creating new A-level structure based on existing B-groups.
- Modifying A-, or B-level structure. For example, deleting or replacing a group.
- Tagging an assembly (interchange assembly).



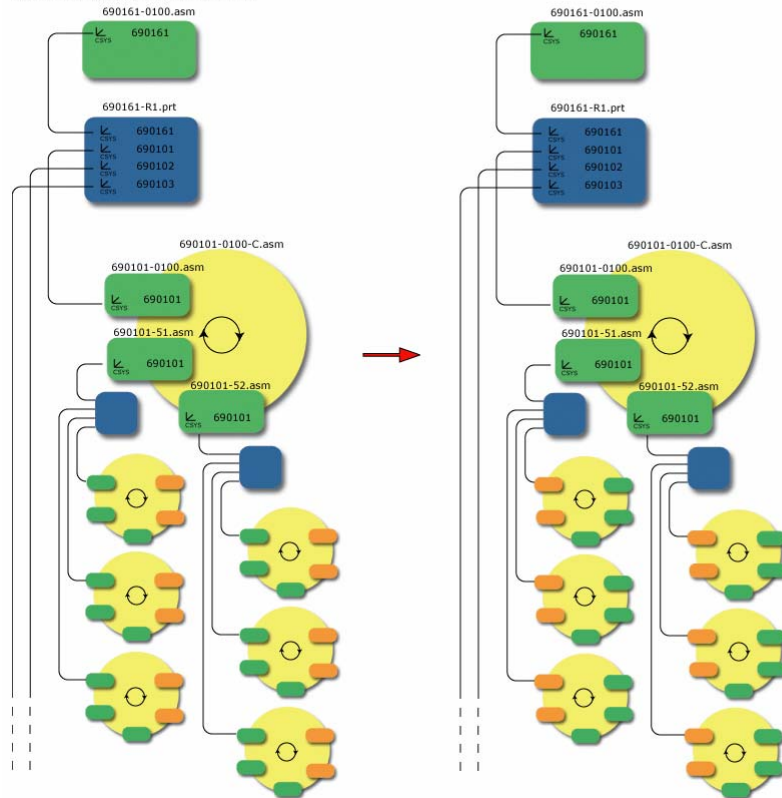
### General structure (Top Down)

- Assembly structure without detailed components
- Parallell "help assembly"
- Template for variant handling
- Reference parts (similar to skeleton)

# LAM cont.

## OPGL- Operational Guidelines

General structure with shrinkwrap



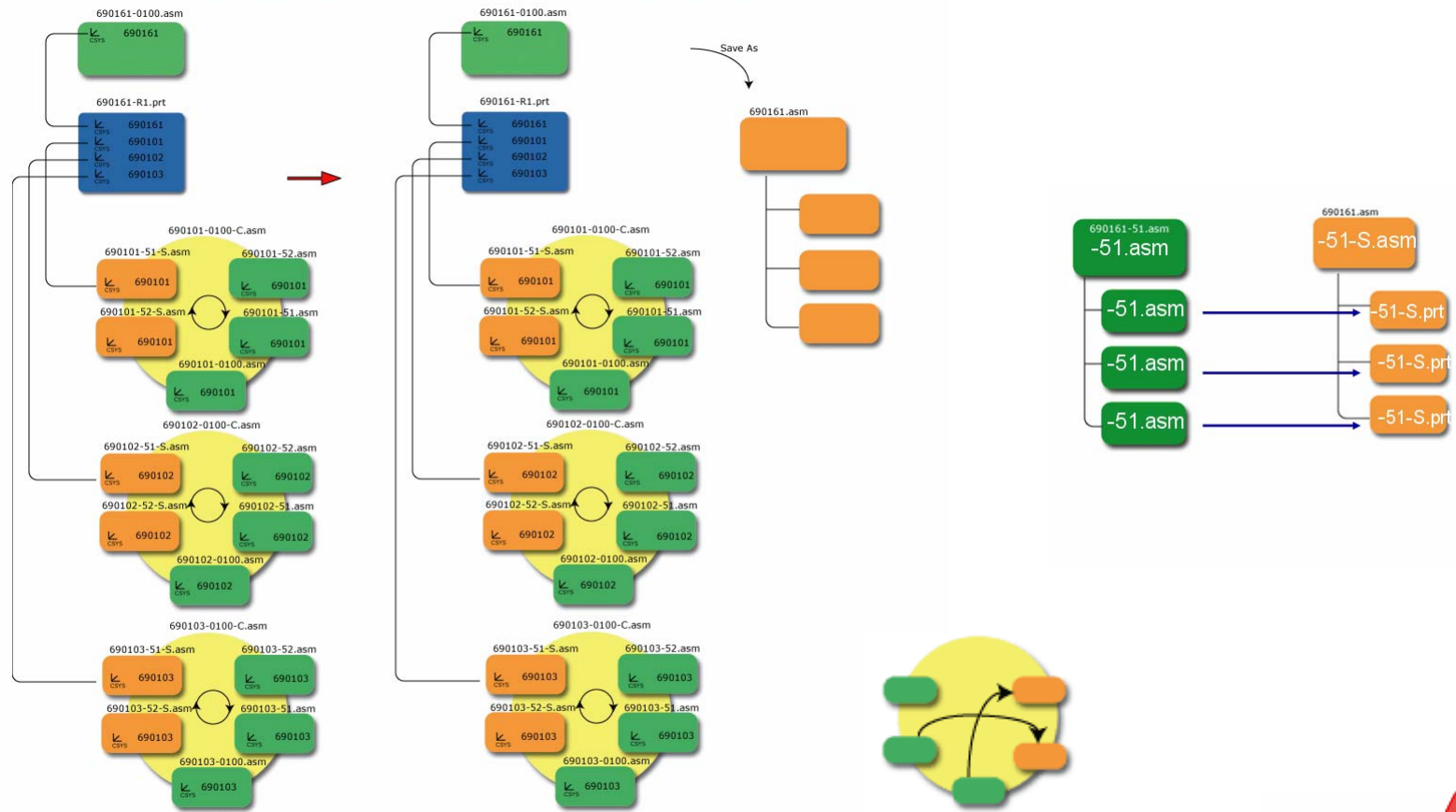
Next step is to create shrinkwrap to the interchange group.

A parallel version of each sub-as consist of shrinkwrap objects. The assemblies are also gathered in t

**Interchange Groups**  
– "Collector" for variants and lightweight groups

# LAM cont.

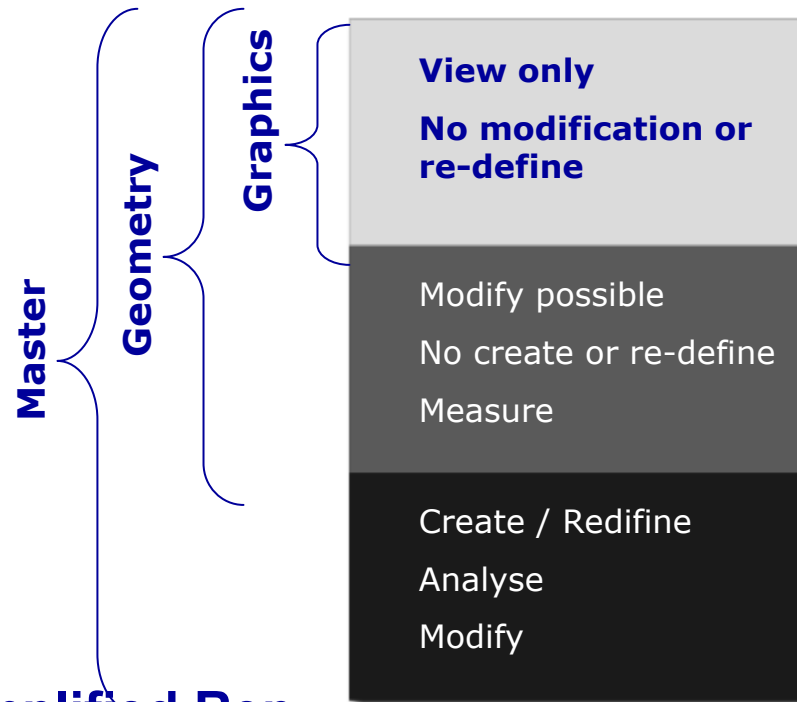
## OPGL- Operational Guidelines



# Simplified representation

## Default reps

- Master
- Geometry
- Graphics



25 % reduction\*

18 % reduction\*

- On-Demand Simplified Rep
- Set config option to enable referencing to geometry reps in drawings  
allow\_refs\_to\_geom\_reps\_in\_drw = yes

\* Based on Tetra Pak data



# Simplified representation

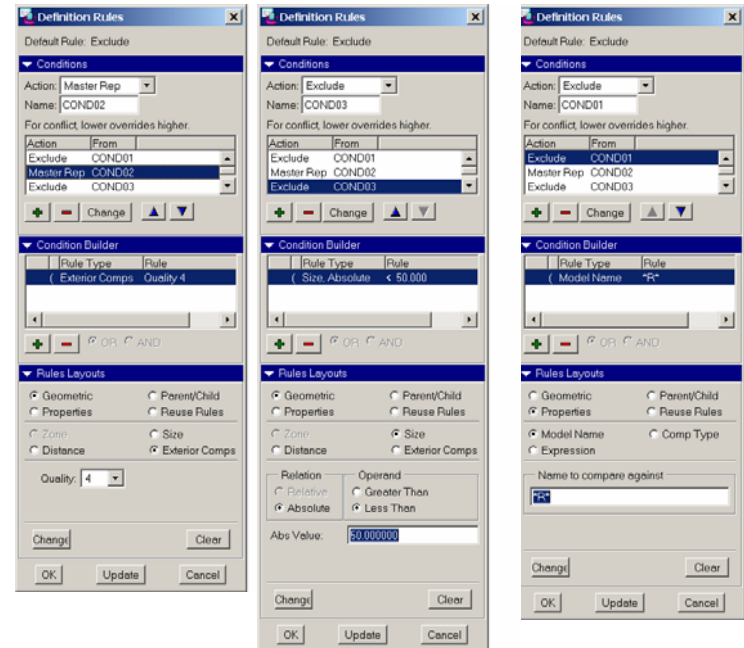
## Definition rules

- Rulebased way of selecting and filtering components
- Rules can be added to each other

Used in LAM to reduce assemblies before Shrinkwrap models are exported

### Warning!

Never use in combination with 'substitute'  
Instead 'Copy Snapshot'



# Shrinkwrap

Replacement of assembly by part

Two types:

## Shrinkwrap model

‘Save as’ to create part

- Two definitions;  
Surface subset (recommended)  
Merged solid

## Shrinkwrap feature

‘Insert shared data’ to create part

- Only ‘Surface subset’
- Associative  
(can be updated)

The screenshot shows the 'Create Shrinkwrap' dialog box with the following settings and annotations:

- Creation Method:**  Surface Subset (indicated by a blue arrow and a red circle with a slash over the 'Faceted Solid' option).
- Quality:** Level: 5 (indicated by a blue arrow and the text '5 good start value').
- Special Handlings:**
  - Auto Hole Filling (indicated by a blue arrow and the text 'Turn off if strange behavior').
  - Ignore Skeletons
  - Ignore Quilts
  - Ignore Small Surfaces (smaller than 0 % of model)
  - Assign Mass Properties (indicated by a blue arrow).
- Include Datum References:**  Select Datums (indicated by a blue arrow).
- Preview Options:**  Real Colors,  Gray-Orange.
- Additional Surfaces:**  Select Surfaces.
- Output File Name:** 977850-51-SAA (indicated by a blue arrow).
- Use default template.

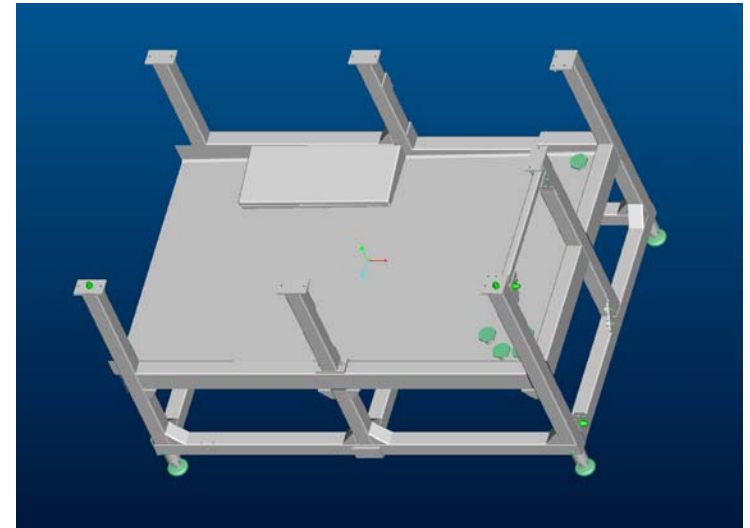
Buttons at the bottom: Create, Preview, Close.

# Shrinkwrap

'Surface subset' vs 'Merged solid'

## Surface subset

- faster creation
- less memory consumption
- much smaller file size
- QLT HLR on drawing
- Inteference check OK



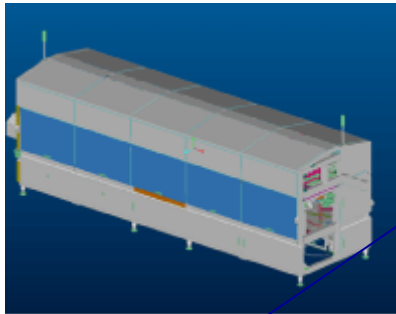
37 % diff.

703 % diff.

1469028-53.asm	Memory [MB]	Peak Memory [MB]	VM Memory [MB]	File size [MB]	Time
No_Ref	182	182	178		50s
Shrinkwrap quality 10					
solid merge	108	143	108	10,2	5s
surface subset	79	83	79	1,45	4s

# Shrinkwrap

## Cont.



90 %

67 %

Shrinkwrap Surface Subset	Memory [MB]	Peak Memory [MB]	VM Memory [MB]	File Size [MB]	Retrieval Time
no_ref	1162	1162	1156		9 min
shrinkwrap no_ref surface subset					
Quality 1	79	81	80	0,53	3 sec
Quality 2	83	81	81	0,78	3 sec
Quality 3	88	89	88	2,57	4 sec
Quality 4	94	95	94	4,42	4 sec
Quality 5	107	112	107	9,69	4 sec
Quality 6	125	134	125	18,04	5 sec
Quality 7	149	165	149	30,38	6 sec
Quality 8	195	219	195	55,96	16 sec
Quality 9	274	311	273	104,42	20 sec
Quality 10	388	444	387	178,80	25 sec

# Tips & Tricks

# Tips & Tricks

## Graphics

Turn off 'selection highlighting'

- Model Tree
- Layer Tree

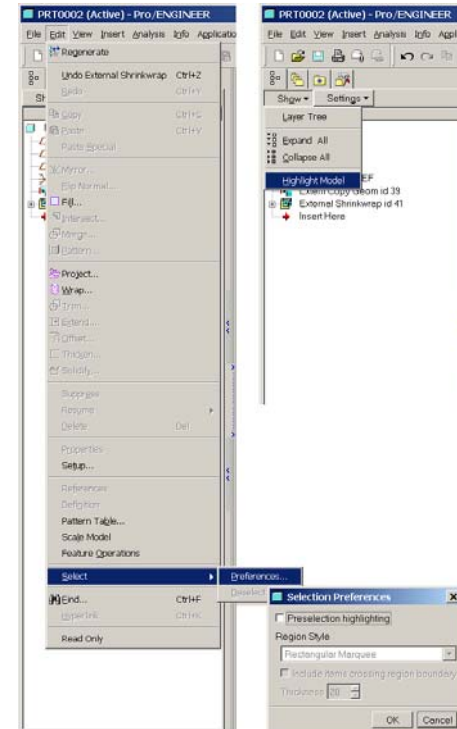
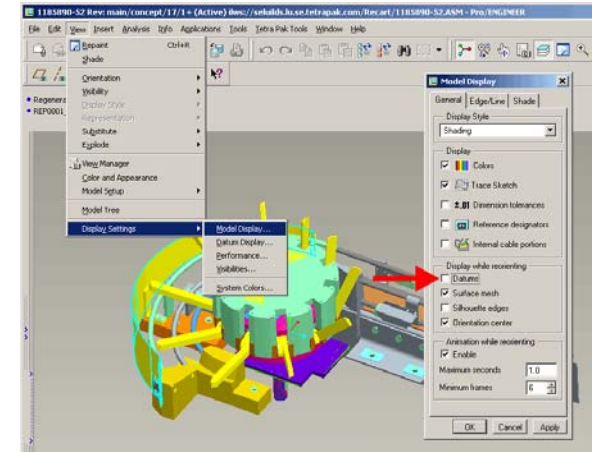
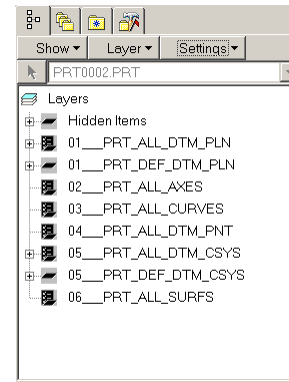
Turn off 'preselection highlighting'

- Preferences

Strict use of layers

- Hide all items

Turn off **Datums** in 'Display While Spinning' to enhance navigation performance

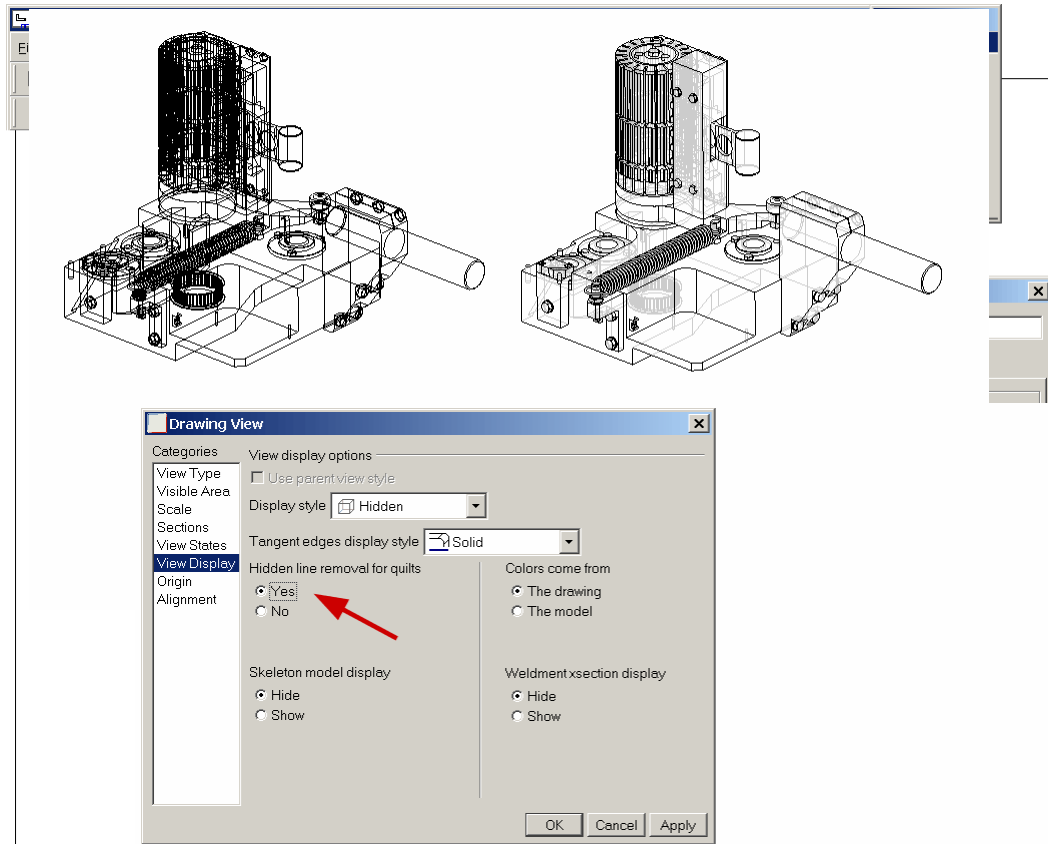


# Tips & Tricks

Drawing mode

Set line display of all views to **Wireframe** when detailing the drawing

Turn off display of views, which are not needed for the moment (erase and resume views)



**Drawing Representation Tool**  
(similar to simplified representation in assembly mode)

**QLT HLR**  
(Quilt Hidden Line removal)

`auto_regen_view = no`  
`allow_refs_to_geom_reps_in_drw = Yes`

# Tips & Tricks

Drawing mode

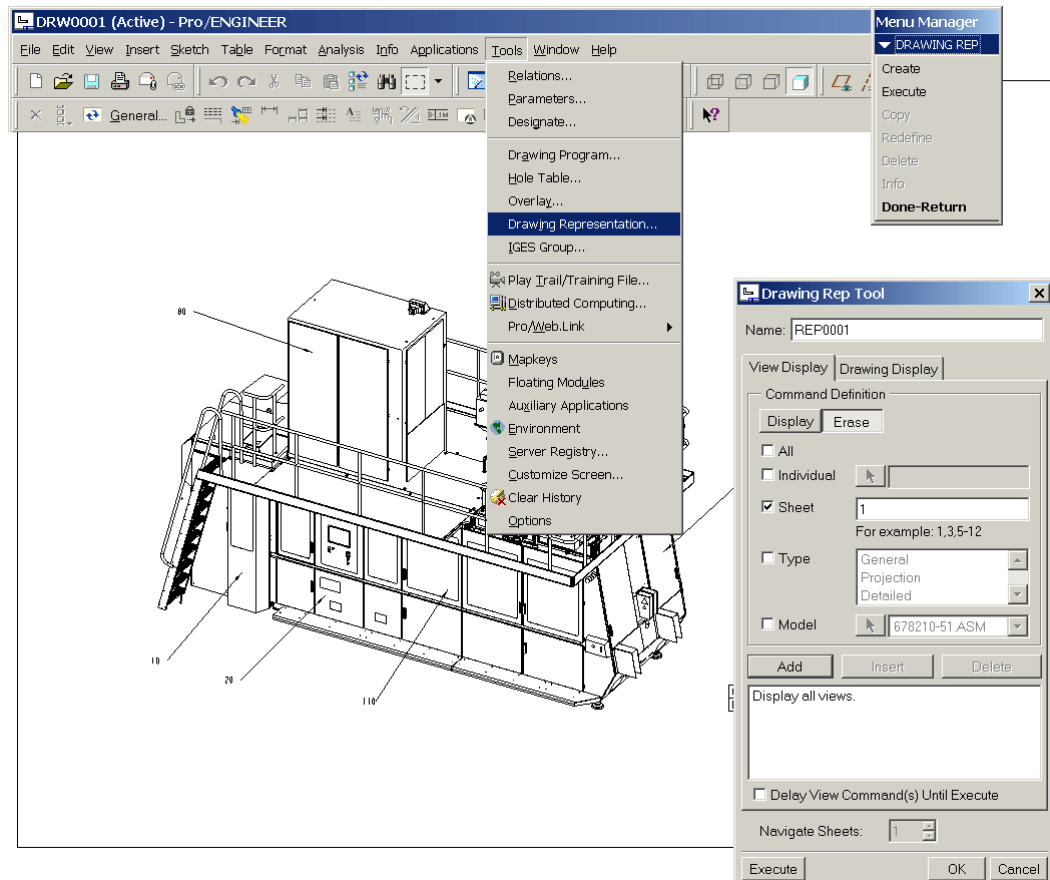
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# Tips & Tricks

## General

- **Avoid assembly features**  
(based on family table, create hidden copies)
- **Avoid 'automatic intersection' for assembly features**  
(adds extra calculations)
- **retain\_display\_memory = yes**  
(makes it smoother to switch windows)
- **open\_simplified\_rep\_default = YES or [Rep Name]**  
(Force use of simplified representation)

# Summary

# Recomendations & General Good Practice

- Agree on which goal to target (performance, time, memory handling, file-size etc)
- Make sure your assemblies are "healthy" (MODELCHECK)
- Focus on control of external references
- Define common mounting rules (PTC Top Down, skeleton)
- General LAM rule: Only carry dataset into session necessary for completing design task
- Geometry Rep
- Open\_Rep\_By\_Default = YES or [Rep Name]
- On Demand Simplified Rep & Definition Rules
- Pre-define 'Assem\_Only' Simp Rep in start assembly
- Establish internal agreement of acceptable shrinkwrap quality level
- Standardize settings and create mapkeys
- Break down shrinkwrap output on rather low level (similar to lowest assembly level)

# Questions