

# KISSsoft and GEMS<sup>®</sup> System Design Data Interface



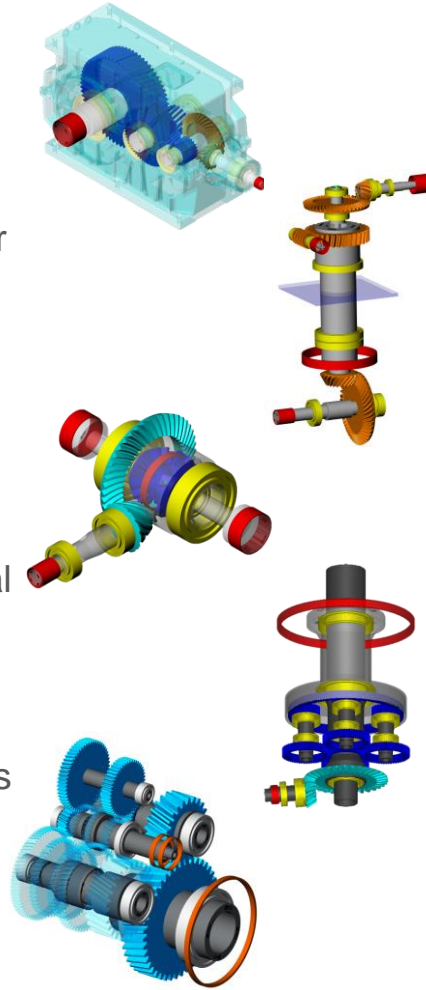
**KISSsoft**  
Drivetrain Design Solutions

**GEMS<sup>®</sup>**  
Gleason Engineering & Manufacturing System

# Two Software Solutions: One Common Goal

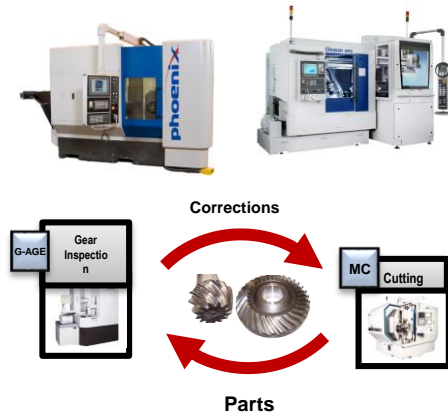
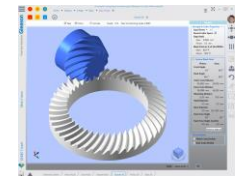
## KISSsys: Design of Transmissions

- Kinematic calculation of shifted transmissions, differentials and power split
- Load Capacity of Transmission, using load spectra
- Efficiency and Thermal Rating, power losses
- Housing compliance considered by stiffness matrix
- Dynamics of Shaft Systems



## GEMS: Calculation and Manufacturing of Bevel and Hypoid Gears

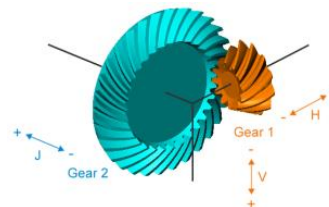
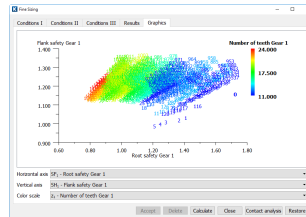
- Design and analysis of spiral bevel & hypoid gears
- Establishment of data for Gleason gear production machines
- Establishment of data for Gleason blade grinding machines
- Closed Loop to manage manufacturing processes



# Two Software Solutions: Complimentary Process for Bevel and Hypoid Design

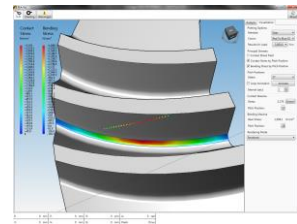
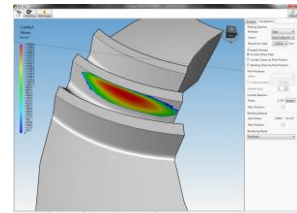
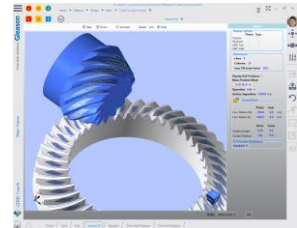
## KISSsoft: Bevel Gear Design

- Geometry and strength calculation according to ISO, AGMA, DIN, DNV, ...
- Sizing and variation of macro geometry such as pressure angle, spiral angle, offset, ...
- Bevel gears in systems and calculation of EPG (VHJ) misalignment from pinion and wheel shafts
- Misalignment are including shaft bending, bearing stiffness, housing deformations ...



## GEMS: Bevel Gear Design

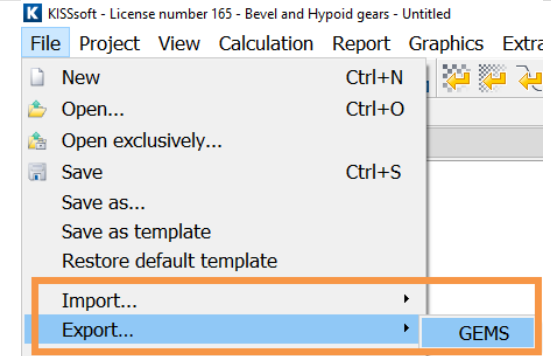
- Open Design, Seamless Connectivity
- Import design data files from CAGE and UNICAL
- Interface with GEMS through touchscreen or conventional mouse/keyboard
- 3D gear and pinion graphics with animation
- Interactive tooth surface and ease-off correction and optimization
- Real blank geometry for both pinion and gear
- 2D/3D loaded TCA, including interactive root bending stress and contact stress output with S-N Curves
- Interactive tool design with graphical slot and blade output



# New Features in KISSsoft Release 2019

## Import and export of GEMS DDE files

- helps for transferring data between SW's.
- no micro geometry is transferred



## Flank fracture for bevel and hypoid gears

- as per Draft ISO 10300-4 (edition 2019)

## Scuffing for bevel and hypoid gears

- as per Draft ISO 10300-20 (edition 2018)

## Differential bevel gears

- sizing of alterations due to bores, required webbing thickness, etc.

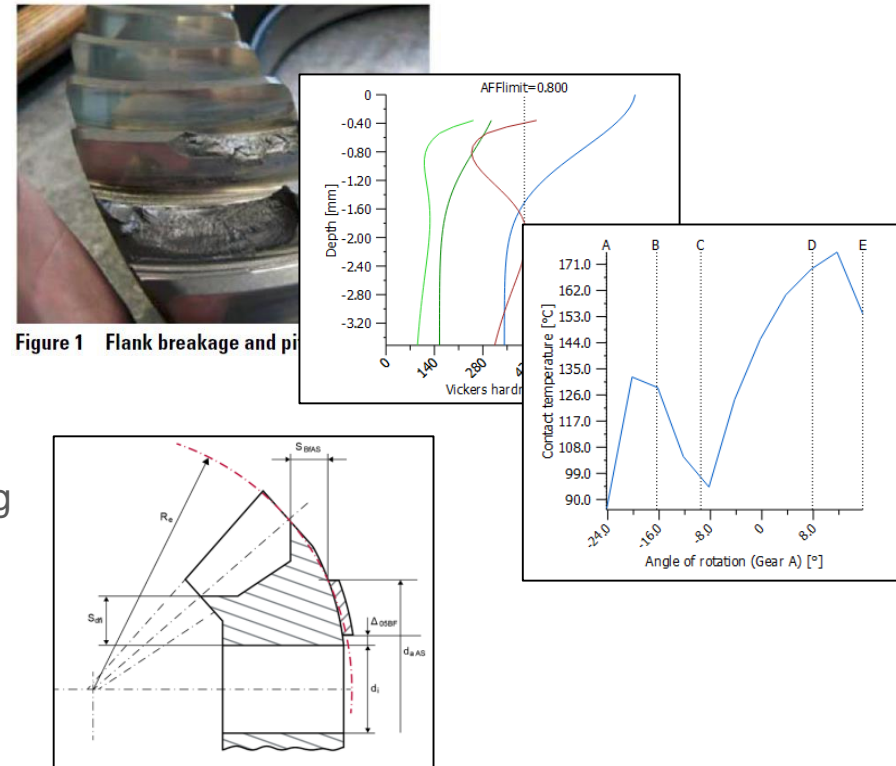
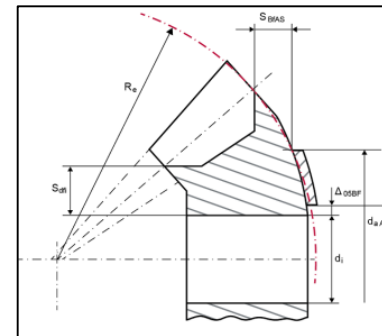
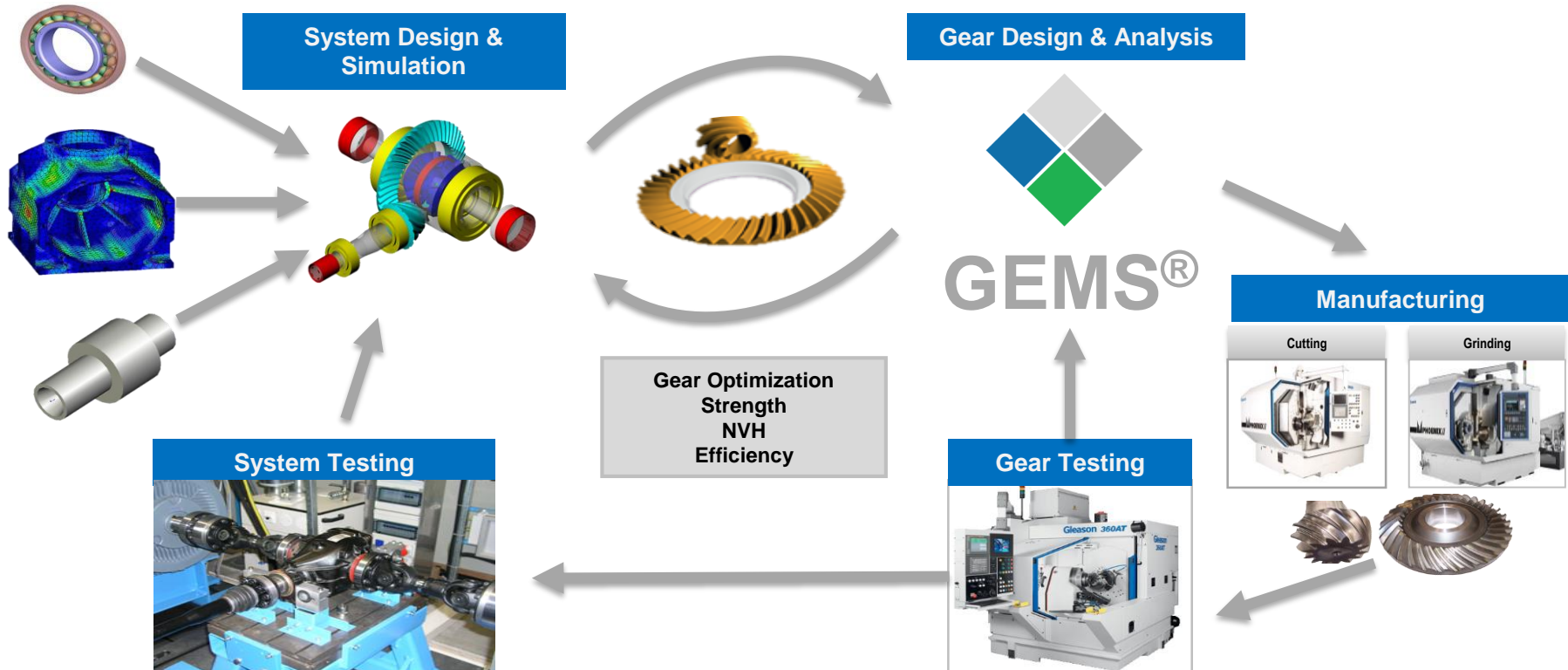


Figure 1 Flank breakage and pi



# System Design Loop: KISSsys using GEMS



Workflow 1: Gear design calculation

Workflow 2: System calculation



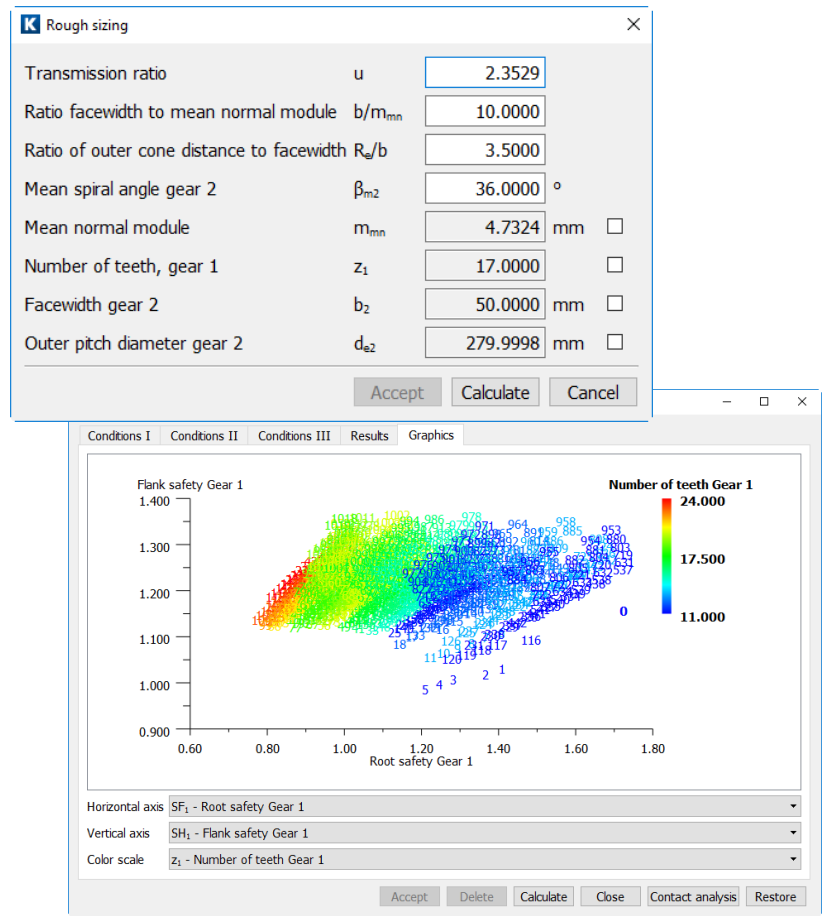
## STEP 1: Sizing in KISSsoft using the rough and fine sizing

1. Entering the load data in KISSsoft

→ the **rough sizing** gives a first design

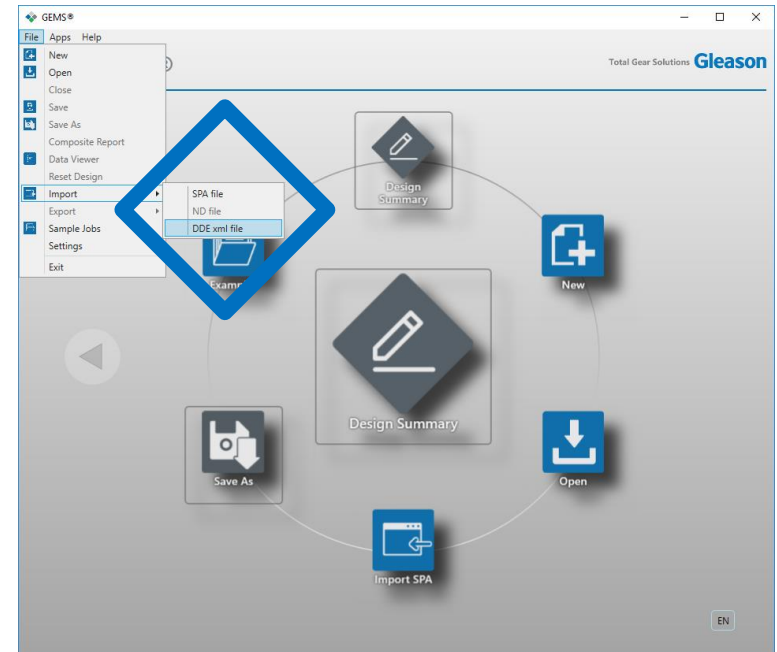
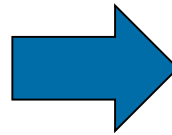
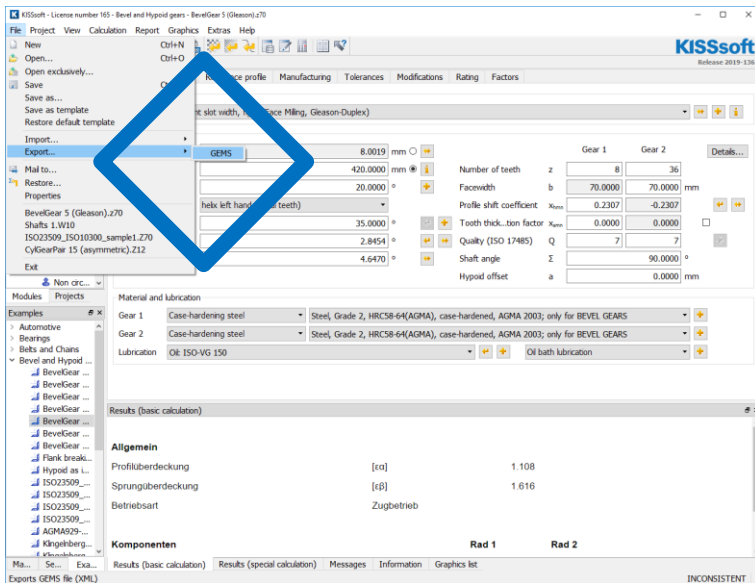
2. Design variation with **fine sizing** (DOE, Run many cases) entering the variation for spiral angle, pressure angle, number of teeth, tooth height

→ the best macro geometry is determined



# Gear design calculation: Export Gear Geometry from KISSsoft to GEMS®

## STEP 2: Export from KISSsoft and Import in GEMS



# Gear Design Calculation: Design and Manufacturing Analysis in GEMS®

STEP 3: check and optimize for manufacturing:  
cutter head system, blade edge radius, tooth thickness, undercut, strength (Q-number, ..),  
TCA (nominal position), etc.

The screenshot displays the GEMS software interface for gear design and analysis. The main window is titled "File: fm-sample1-completing-formate-hypoid-90degree-lh-ratio13x44-module04". The "Design" tab is active, showing various design parameters and options.

**Design Parameters:**

- General Info: Design ID: FM\_Sample1, Engineer ID: MJB, Customer ID: Bevel\_Gear\_Sample
- Design Description: (Empty)
- Gearset: Gearset Type: Hypoid, Manufacturing Method: Completing, Gear Manufacturing Process: FORMATE, Pinion Gear Manufacturing Method: (Empty)
- Shaft Angle: 90.0°
- Number of Teeth: Pinion: 13, Gear: 44
- Gear Face Width: 32.0000 mm
- Module: 4.36400 mm, Pitch Diameter: 192.0160 mm
- Pinion Offset: 30.0000 mm
- Pinion Spiral Angle: 45.0°, Pinion Hand: Left
- Pinion Pressure Angles: Sum: 40.0°, O.B.: 0.0°
- Drivers: Pinion, Rotation: Reversible
- Depth Factor - K<sub>a</sub>: 4.0
- Backlash: Min: 0.1000 mm, Max: 0.1500 mm
- Gear Addendum Factor - C<sub>t</sub>: 0.17
- Direct Dimensional Input: Working Depth: 0.0 mm, Addendum: 0.0 mm, Whole Depth: 9.3912 mm, Addendum Angle: 0.0, Dedendum Angle: 0.0
- Advance Settings: Gear Root Line Face Width: 0.0 mm, Pinion Root Line Face Width: 0.0 mm, Pinion Face Width: 36.8596 mm, Special Depth Constant: 0.0, Mean Gear Radius: 0.0 mm, Gear Pitch Angle: 0.0, Pinion Face Angle: 0.0, Pinion Root Angle: 0.0, Eliminate Interference: checked, Fixed Settings Gear Calculation: unchecked

**Strength & Cutter Properties:**

- Gear Point Width: 2.032 mm
- Round Cutter Specs: checked
- Edge Radii: Pinion: 0.889 mm, Gear: 1 mm

**Tooth Contact Analysis (TCA):**

The TCA window shows 3D surface plots for Drive (Convex) and Coast (Concave) sides, along with 2D cross-sections and Transmission Error plots. The Transmission Error plots show EV, PH, and GI values for both Drive and Coast sides.

Parameter	Drive (Convex)	Coast (Concave)
Totals EV	0.4483 mm	0.7385 mm
Totals PH	0.3246 mm	0.5924 mm
Totals GI	0.0000 mm	0.0000 mm

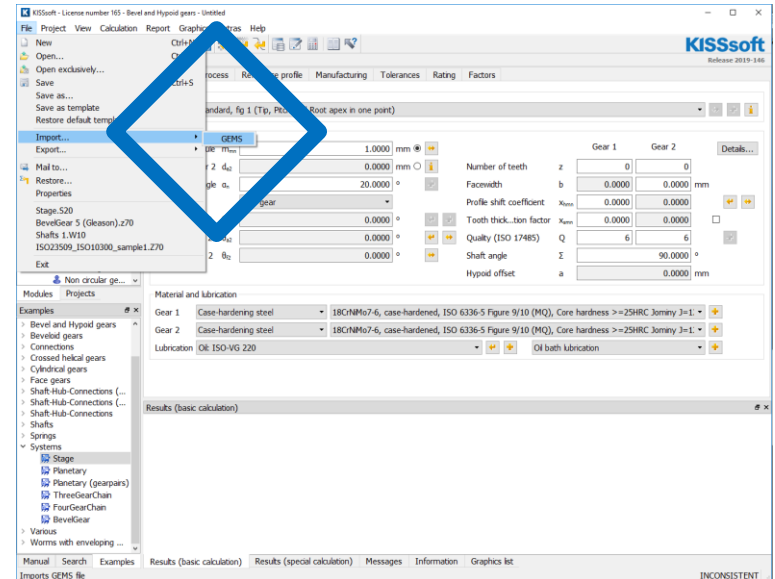
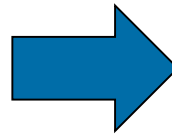
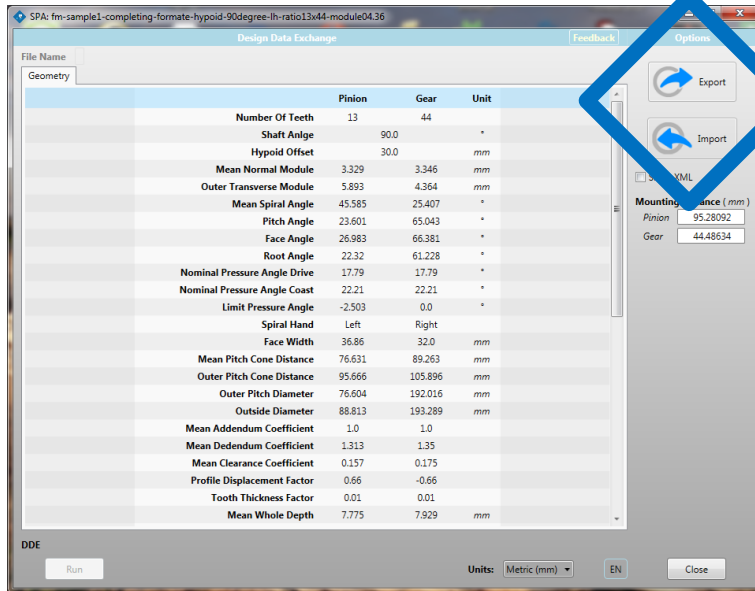
**Transmission Error Legend:**

Location	TE	PP
Toe	-25.59	-0.43
Mean	-20.14	-0.55
Heel	-31.03	-0.51
Contact	-18.77	-0.62
Toe	-17.65	-0.53
Heel	-50.60	-0.59

The interface also includes a "Clean up" section, "Custom B" settings, and "Display Options" for the TCA results.

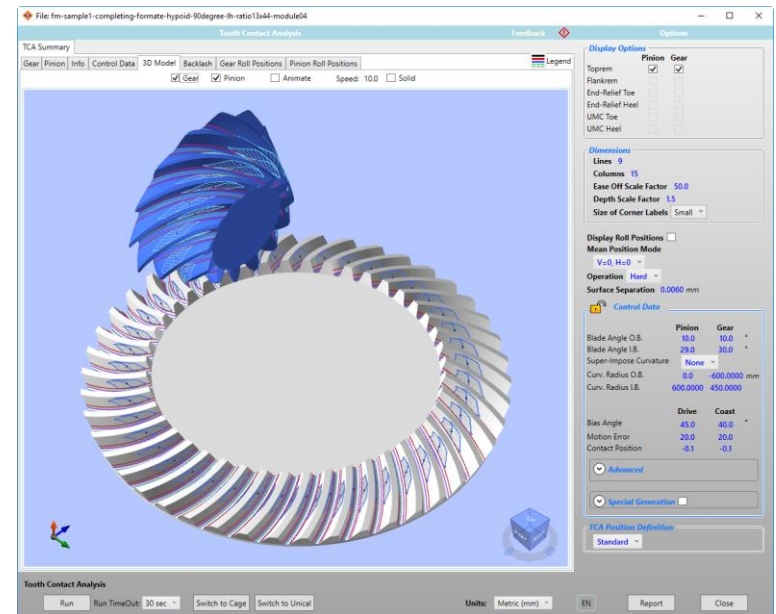
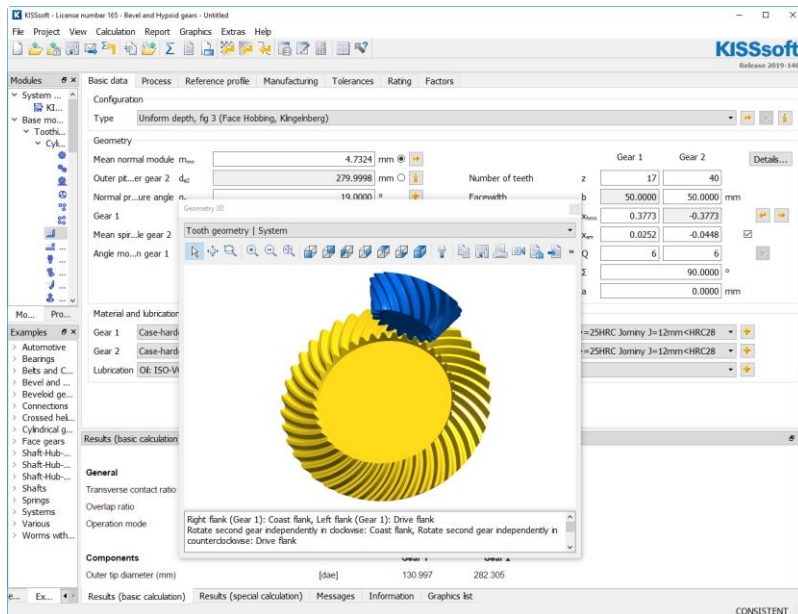
# Gear Design Calculation: Export Gear Geometry from GEMS® to KISSsoft

## STEP 4: Export Gear Geometry from GEMS® to KISSsoft



# Gear Design Calculation: Final Documentation in KISSsoft for Strength Rating

## STEP 5: the calculation in GEMS and KISSsoft are consistent



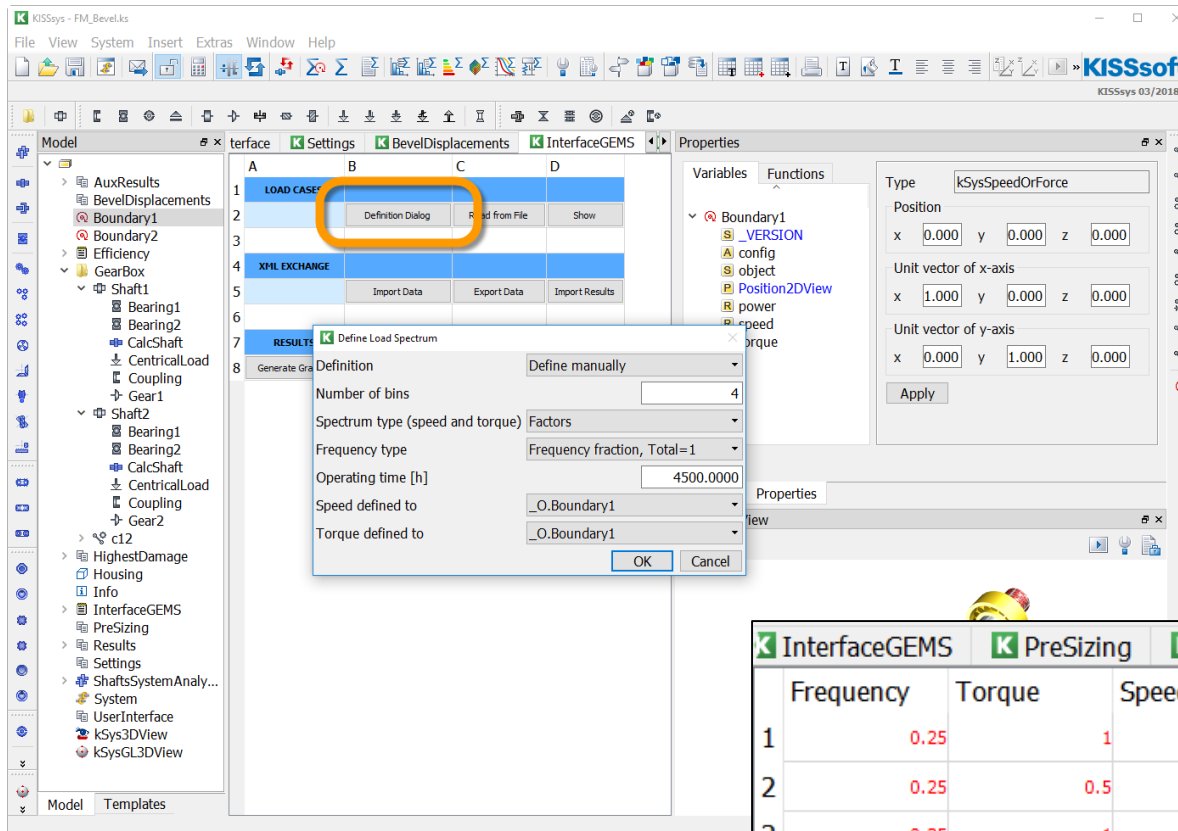
Workflow 1: Gear design calculation

Workflow 2: System calculation



# System Calculation: Define Load Cases in KISSsys

## STEP 1: Create system model in KISSsys and define load cases



Frequency	Torque	Speed	Name	E_mm
1	0.25	1	1Drive 100%	
2	0.25	0.5	0.5Drive 50%	
3	0.25	-1	-1Coast 100%	
4	0.25	-0.5	-0.5Coast 50%	

# System Calculation: EPG Values in KISSsys

## STEP 2: Calculate misalignment values EPG and export to GEMS



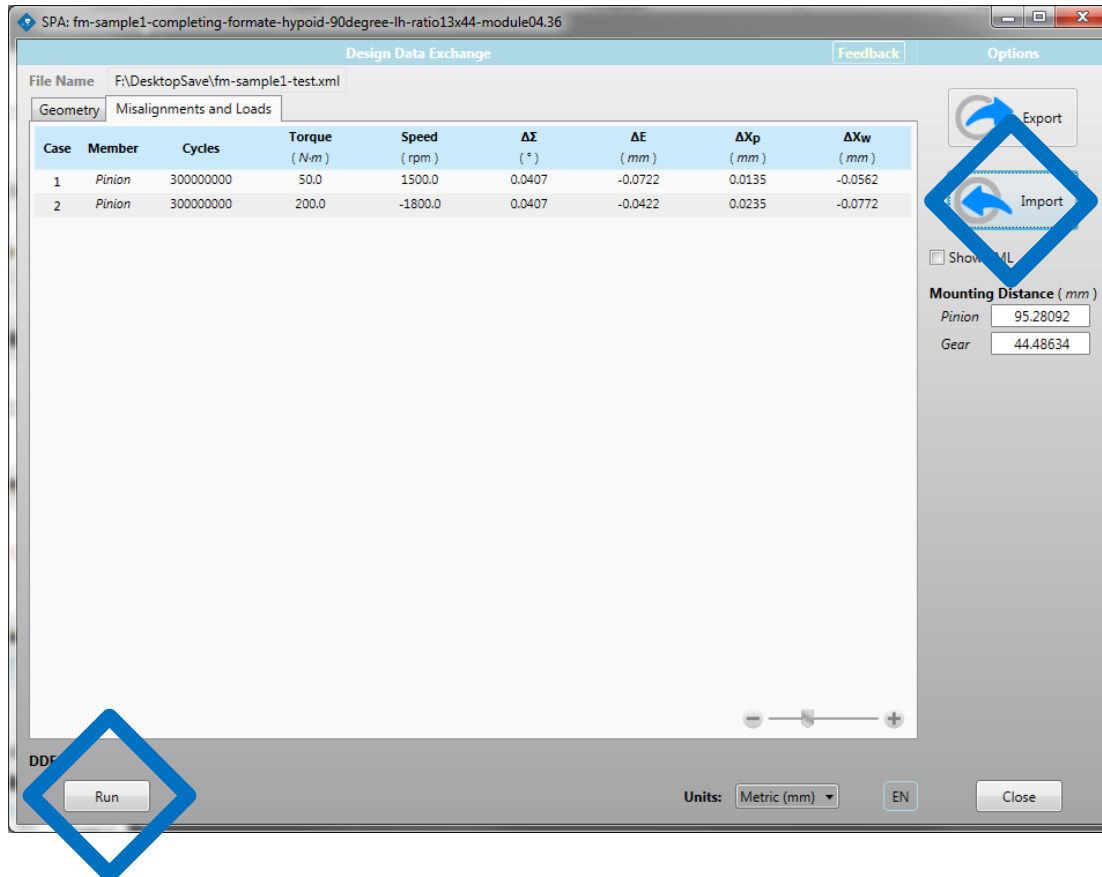
The screenshot displays the KISSsys software interface. The main window is titled "KISSsys - FM\_Bevel.ks". The menu bar includes File, View, System, Insert, Extras, Window, and Help. The toolbar contains various icons for file operations and analysis. The interface is divided into several panes:

- Model Tree (Left):** A hierarchical tree view showing the model structure. The "InterfaceGEMS" node is selected.
- Table (Center):** A table with columns A, B, C, and D. The "XML EXCHANGE" section is highlighted with an orange circle. The "Export Data" button is also highlighted.
- Diagram (Top Right):** A schematic diagram of a gearbox assembly with shafts and gears.
- kSysGL3DView (Bottom Right):** A 3D rendering of a gearbox assembly, showing a large gear and a shaft with a pinion.

A	B	C	D
1	LOAD CASES		
2		Definition Dialog	Read from File Show
3			
4	XML EXCHANGE		
5		Import Data	Export Data Import Results
6			
7	RESULTS	Type	Member Load Case
8	Generate Graphic	Contact pressure	Pinion

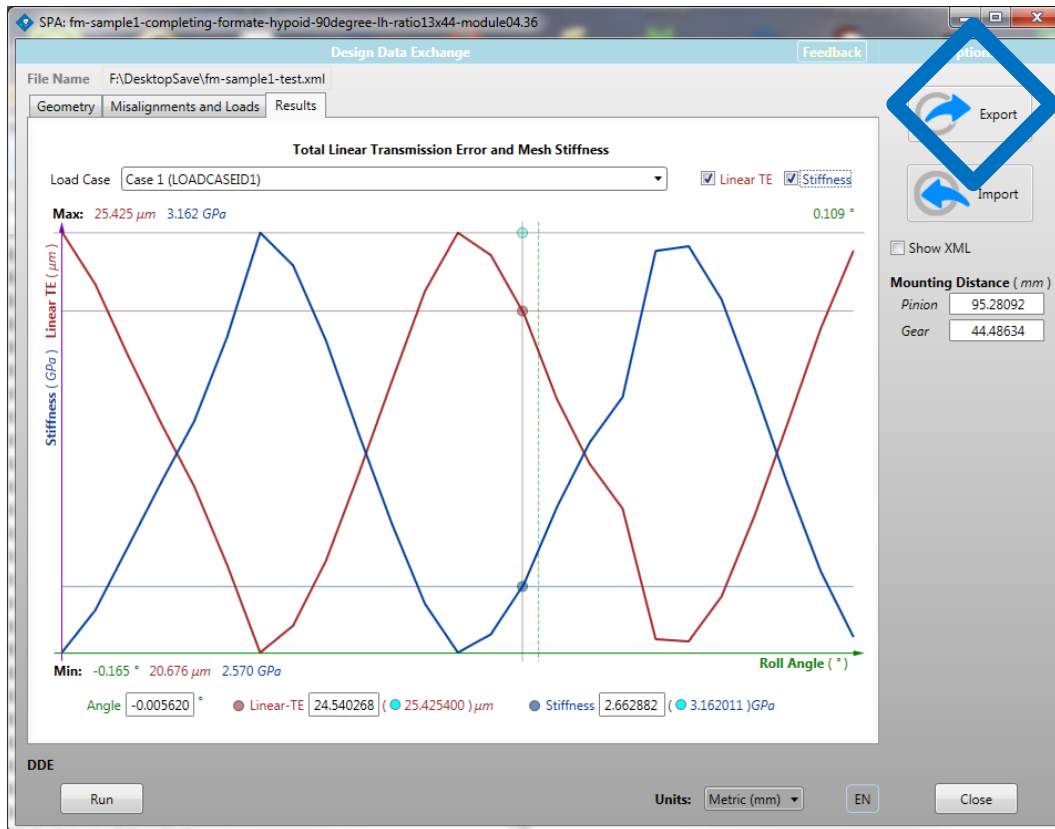
# System Calculation: Import EPG Values in GEMS

STEP 3: Import Load Cases and Press RUN to perform the FEA calculation



# System Calculation: Transmission and Stress Results in GEMS

STEP 4: Results generated. Export to display in KISSsys



# System Calculation: Inclusion of Analysis Results in KISSsys

STEP 5: Import Stress and TE results in KISSsys

Future Plan: Continue to run NVH analysis in KISSsys



The screenshot displays the KISSsys software interface. The 'Diagram' window shows a table with the following content:

A	B	C	D
1	LOAD CASES		
2		Definition Dialog	Read from File
3			Show
4	XML EXCHANGE		
5		Import Data	Export Data
6			Import Results
7	RESULTS	Type	Member
8	Generate Graphic	Contact pressure	Pinion

The 'Import Results' button in the 'XML EXCHANGE' section is highlighted with an orange circle. Below the table, a 3D model of a gearbox assembly is shown. To the right, a 'Contact Pressure' plot displays a color-coded stress distribution across a width of 16.0 mm, with values ranging from -16.0 to 16.0 mm.

Let us stay in touch!

If you are interested in testing and acquiring the interface, contact us at

[info@KISSsoft.AG](mailto:info@KISSsoft.AG) or

[sales@Gleason.com](mailto:sales@Gleason.com)

