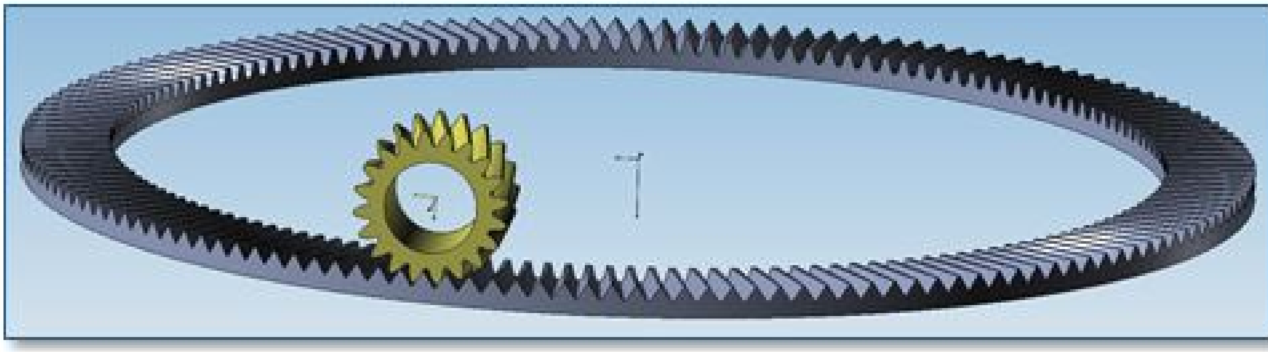
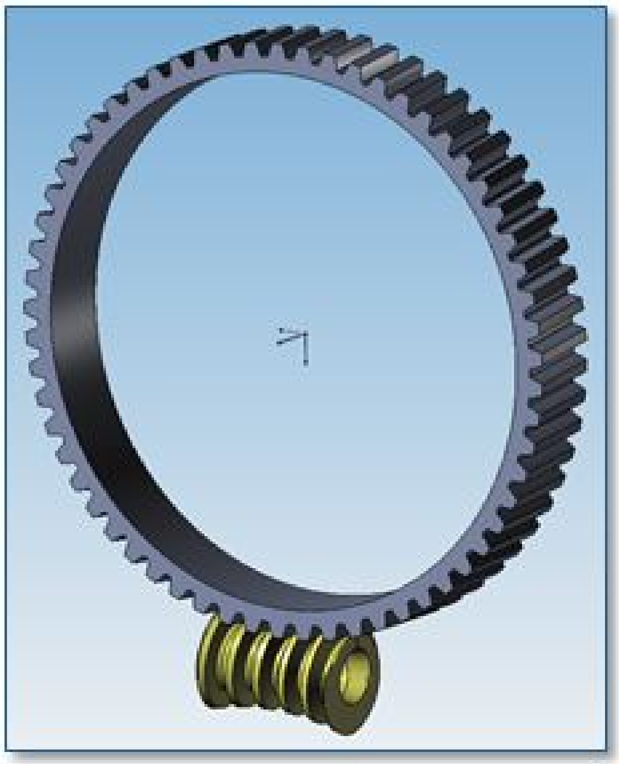
General Overview

IGD – Integrated Gear Design – is a powerful and comprehensive computer program for gear design, analysis, optimization and troubleshooting of gear drives. It integrates a virtual gear generator with algorithms for tooth contact analysis, backlash analysis, free-form design and automatic generation of finite element models for stress analysis. IGD is the tool to be used when noise, vibration, life, or endurance are key factors to be considered for existing or new gear drives.

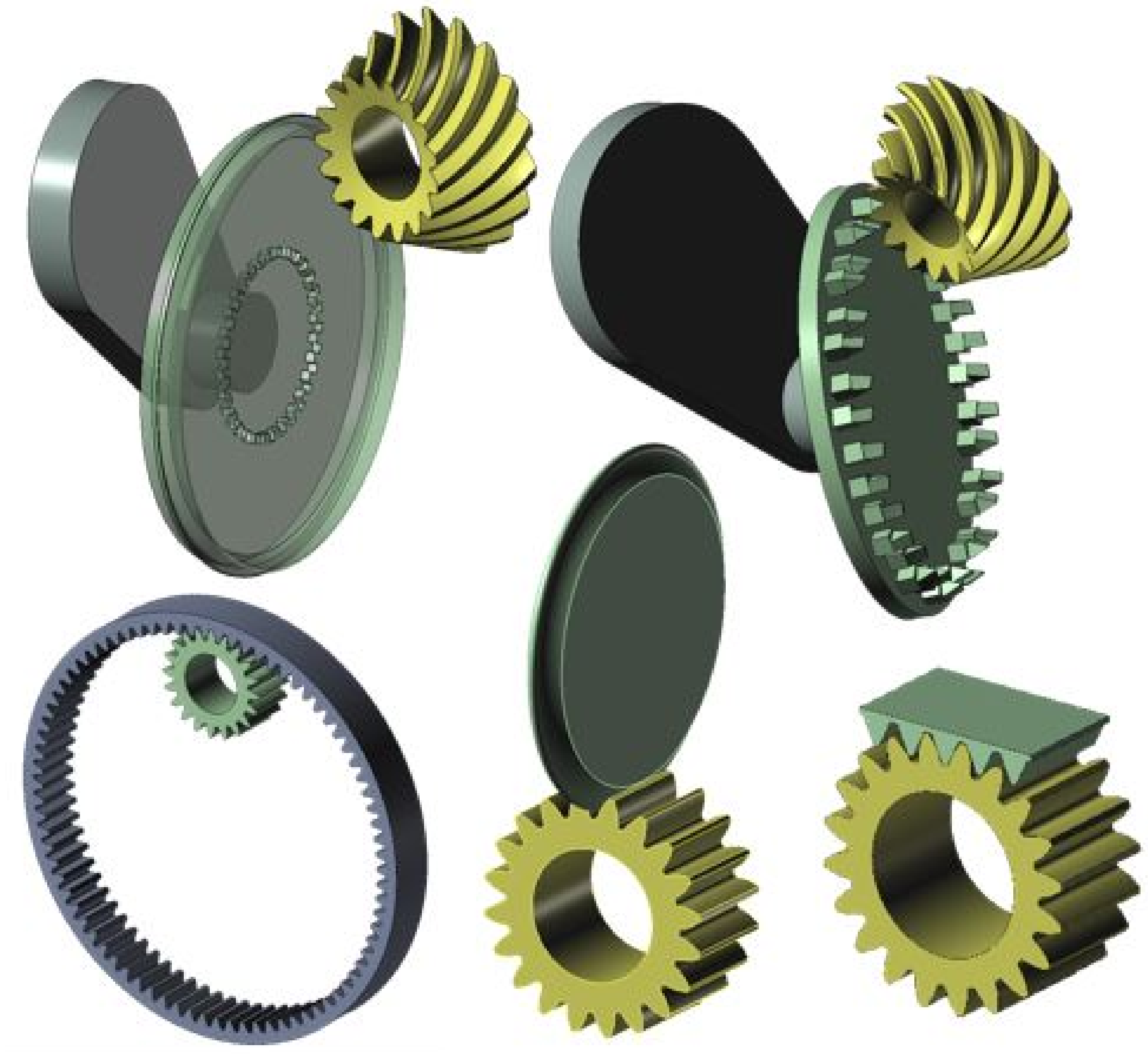
IGD has been developed thinking of both advanced gear design and gear manufacturing. The virtual gears can be generated by virtual cutting tools mimicking the corresponding manufacturing processes. The gear models generated by IGD can be exported to main CAD/CAE computer programs in IGES, OBJ or STL graphics formats.

Some of the latest developments are the generation of offset face gear drives and the generation of double-enveloping (globoidal) worm gear drives.

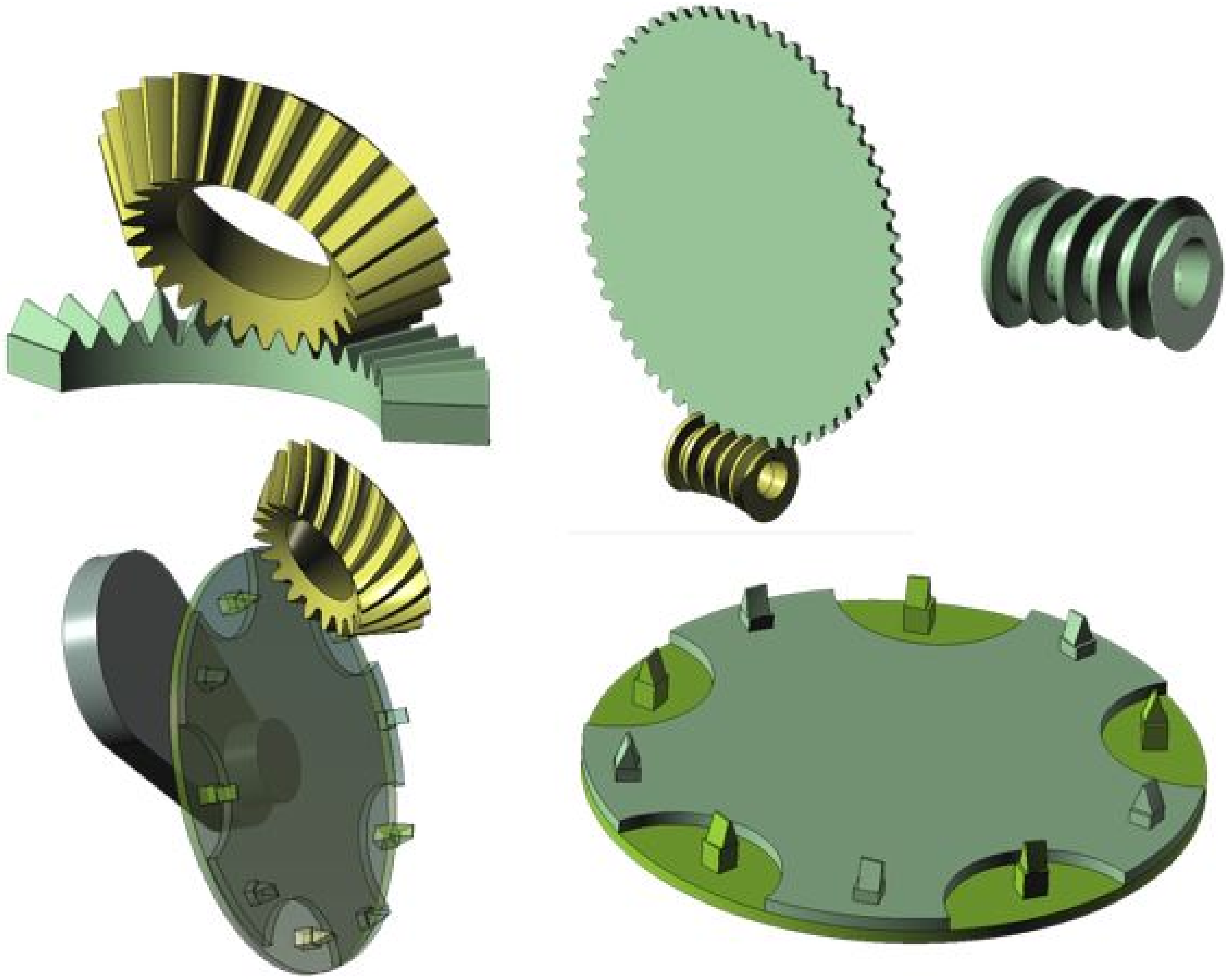




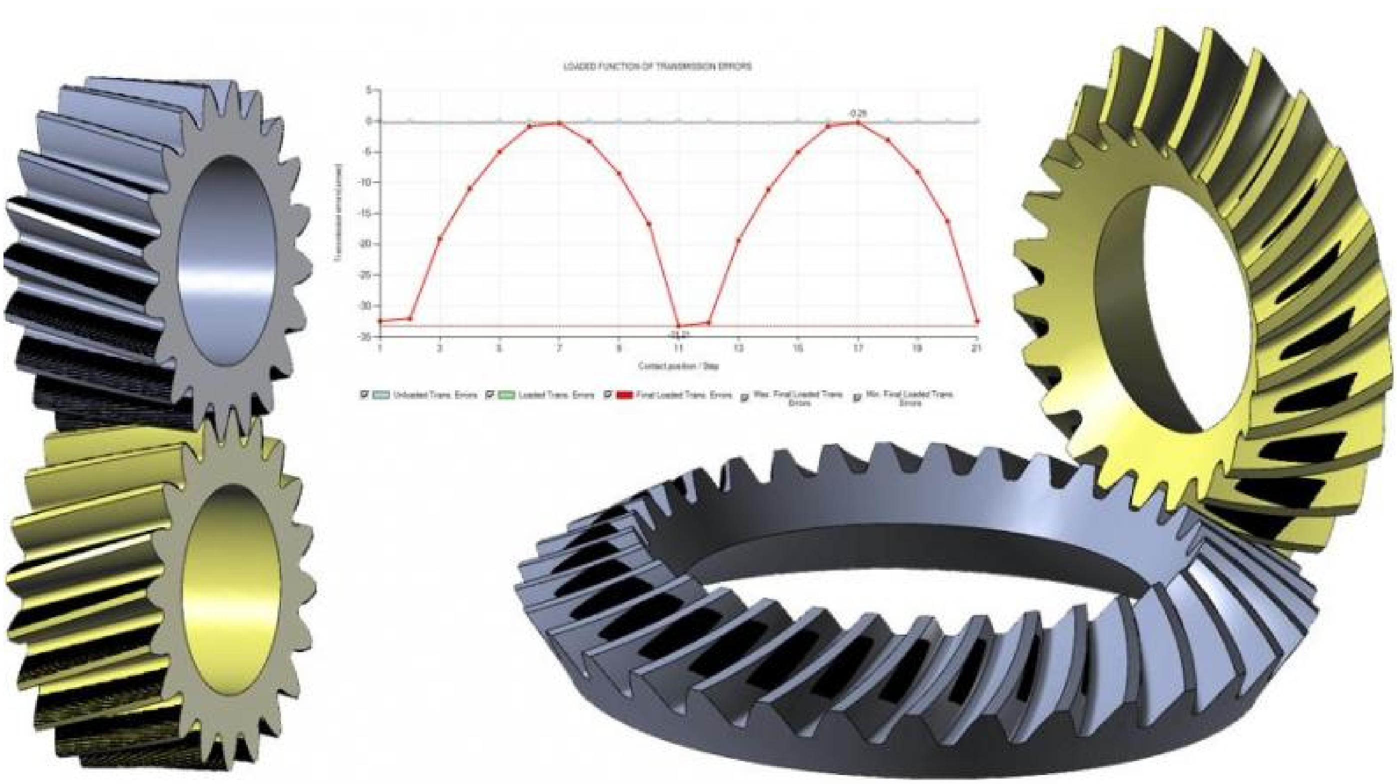
The virtual gear generator simulates the gear cutting process to generate the gear tooth geometry with the highest precision. Some of the generating tools considered for virtual gear generation are shown below:



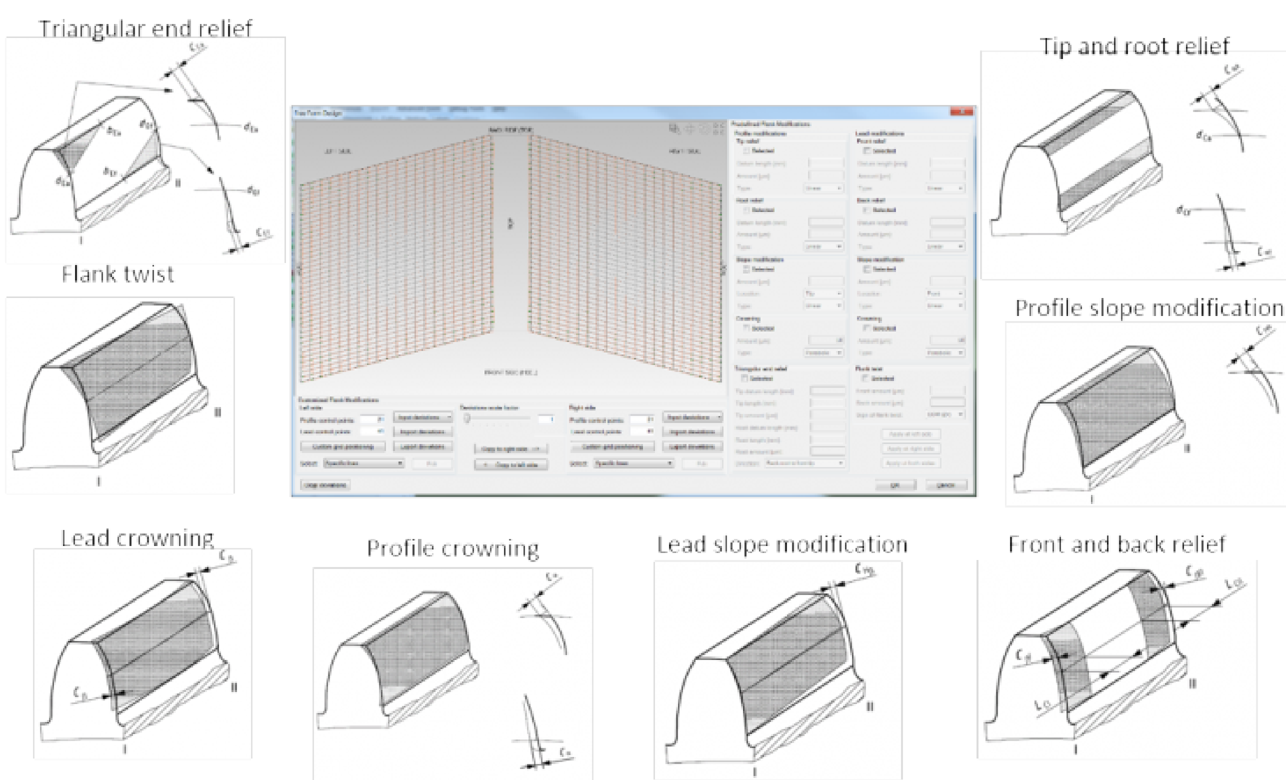
Other virtual generating tools include imaginary crown gears, worm cutters, grinding worms or dual face-hobbing cutters.



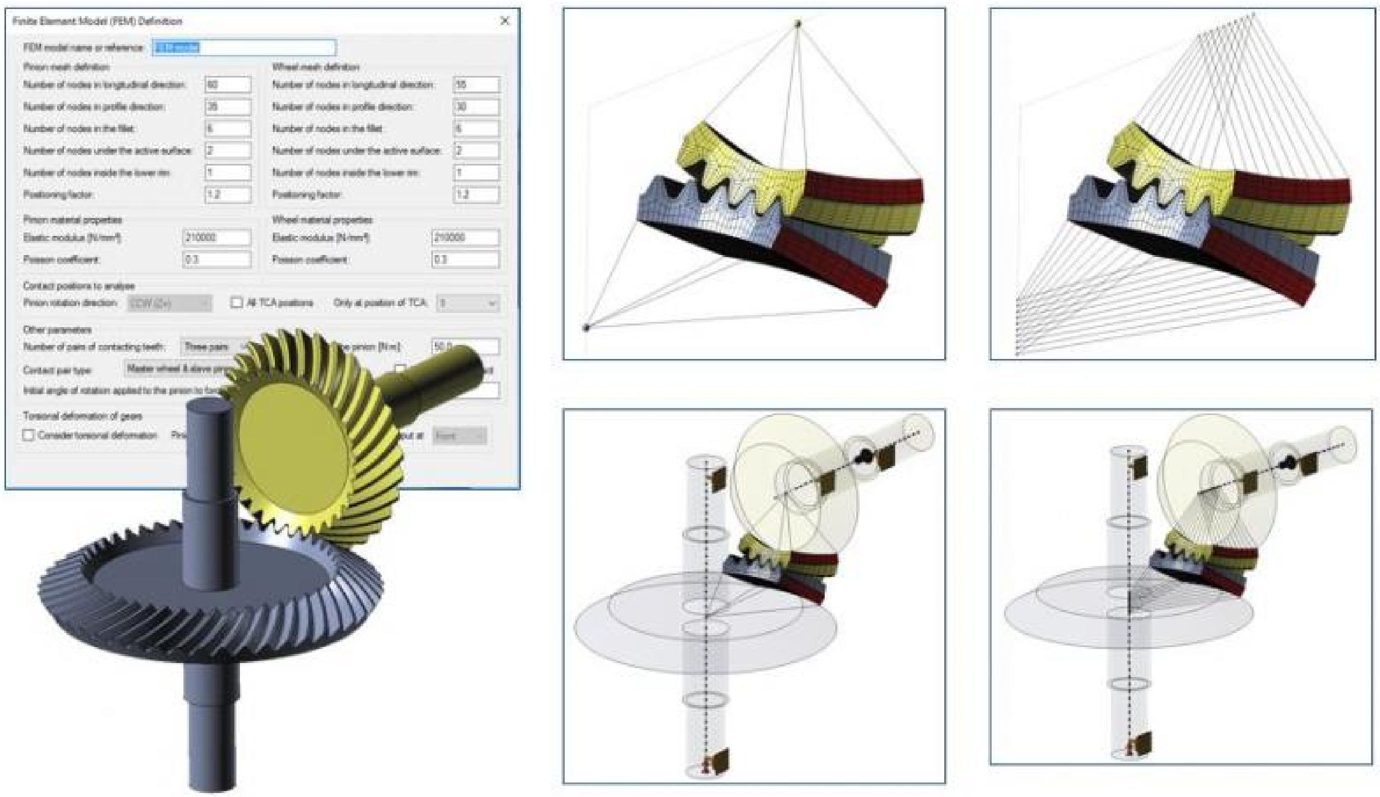
Simulation of meshing and tooth contact analysis are key algorithms to obtain the contact pattern estimation and expected function of transmission errors. It is widely accepted that transmission errors are one of the main sources of excitation of gear whine noise so that obtaining a favorable function of transmission errors is one of the main goals that have to be achieved when designing quiet gear drives. IGD implements a new tooth contact analysis algorithm that takes into account the positional study of the surfaces and the minimization of the distances until contact is achieved. This algorithm for tooth contact analysis does not depend on the precondition that the surfaces have to be in point contact or the solution of any system of nonlinear equations as other existing approaches and can be applied for tooth contact analysis of gear drives in point, line or edge contacts. Contact patterns, contact paths, sliding velocities and transmission errors are obtained, considering errors of alignment, all over one or two cycles of meshing.



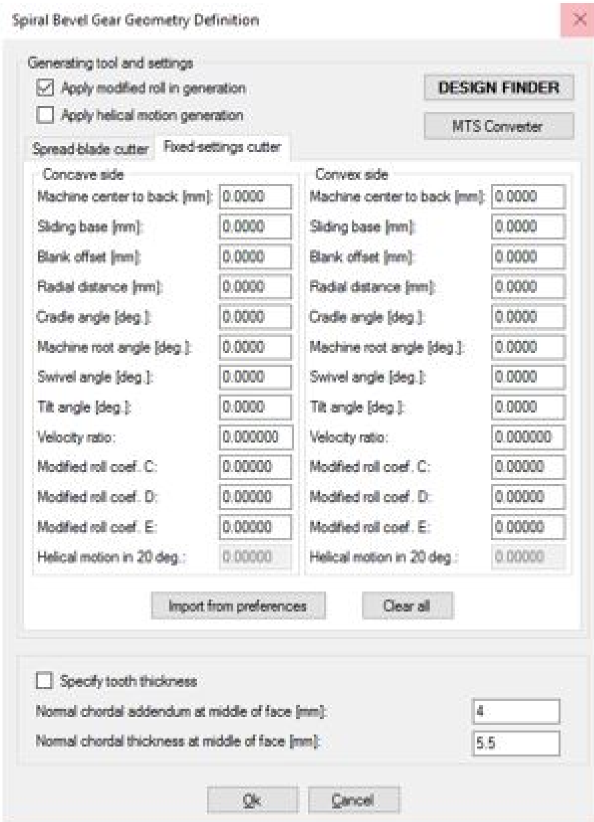
The free-form design module in IGD provides a unique approach for simulation of any type of surface modification including measured deviations. Predefined flank modifications have been also implemented. The user has full control on the desired final gear tooth surface form in order to evaluate or simulate microgeometry modifications and manufacturing errors on the contact pattern, function of transmission errors, or contact and bending maximum stresses.

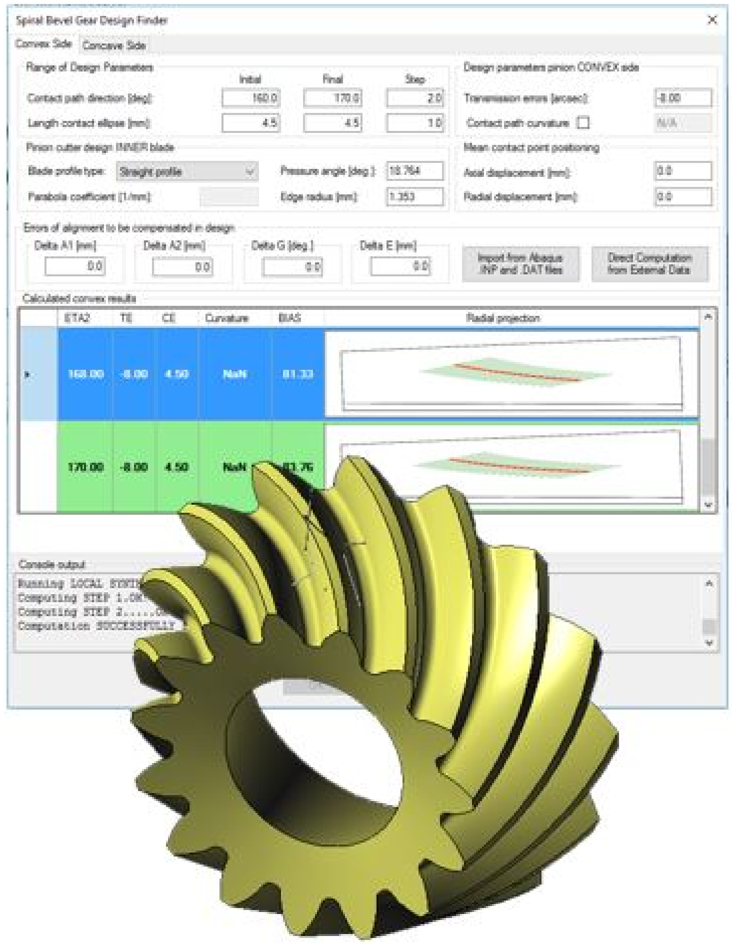


IGD implements the automatic generation of finite element models for stress analysis of gear drives at any given contact position or for the whole cycle of meshing. It is available for any tooth surface topology including free-form design or flank edge coordinate definition. The FE model can incorporate torsional deformations or shaft deflections. The generated FE models can be exported to the main commercial finite element analysis computer programs (ABAQUS and ANSYS) for stress analysis.



IGD naturalizes the process of designing and analyzing gear transmissions, increasing the efficiency at the design stage and shortening the time of development of new gear drives. The virtual simulation of the behavior of gear transmission reduces the number of required design steps and increases the design reliability.


Spiral Bevel Gear Geometry Definition
Generating tool and settings
Apply modified roll in generation
Apply helical motion generation
DESIGN FINDER
MTS Converter
Spread-blade cutter
Fixed-settings cutter
Concave side
Convex side
Machine center to back [mm]:
Sliding base [mm]:
Blank offset [mm]:
Radial distance [mm]:
Cradle angle [deg.]:
Machine root angle [deg.]:
Swivel angle [deg.]:
Tilt angle [deg.]:
Velocity ratio:
Modified roll coef. C:
Modified roll coef. D:
Modified roll coef. E:
Helical motion in 20 deg.:
Import from preferences
Clear all
Specify tooth thickness
Normal chordal addendum at middle of face [mm]:
Normal chordal thickness at middle of face [mm]:
Ok
Cancel


Spiral Bevel Gear Design Finder
Convex Side
Concave Side
Range of Design Parameters
Initial
Final
Step
Contact path direction [deg]:
Length contact ellipse [mm]:
Design parameters pinion CONVEX side
Transmission errors [arcsec]:
Contact path curvature
Pinion cutter design INNER blade
Blade profile type:
Straight profile
Pressure angle [deg.]:
Parabola coefficient [1/mm]:
Edge radius [mm]:
Mean contact point positioning
Axial displacement [mm]:
Radial displacement [mm]:
Errors of alignment to be compensated in design
Delta A1 [mm]
Delta A2 [mm]
Delta G [deg.]
Delta E [mm]
Import from Abaqus .INP and .DAT files
Direct Computation from External Data
Calculated convex results
ETA2
TE
CE
Curvature
BIAS
Radial projection
Console output