

Connect to All



RECURDYN

Particleworks

CFD

FEA

MBD

MFBD

Control

MBS-FE Coupling

EDEM

CoLink

Simulink

FMI

SimulationX

AMESim

Simplorer

RecurDyn V9R3: Toolkits, Controls, and Co-simulation Interfaces

Nelson Woo



1. RecurDyn/DriveTrain

2. Other Toolkits

- Particleworks I/F, EDEM I/F
- EHD
- Control, CoLink
- Chain
- R2R

3. Others

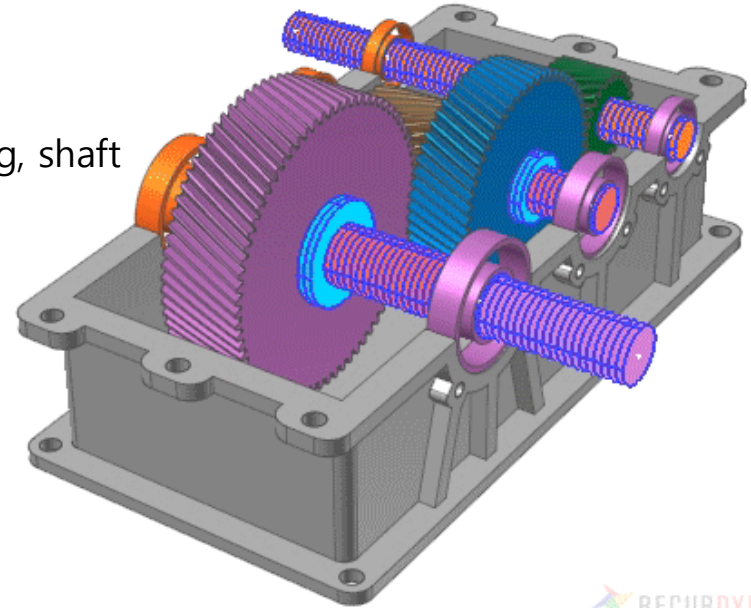


RecurDyn/DriveTrain

1. Overview of RecurDyn/DriveTrain

1. Target Uses

- 1) Drivetrain
 - A. Gearbox modeling composed of gear, bearing, shaft
 - a. such as transmission, speed reducer
- 2) Electrified Powertrain
 - A. Drivetrain for motor-driven system



2. Features

1) KISSsoft Interface

- A. Embedded KISSsoft GUI/Solver
 - a. Gear modeling and bearing modeling
 - b. Gear Analytic Contact
 - c. Gear analysis using embedded KISSsoft GUI is supported

2) Dynamic Analysis of Drivetrain

- A. KISSsoft (Static Analysis) + RecurDyn (Dynamic Analysis)
- B. Understanding the behavior of the drivetrain

3) MFBD (Multi-Flexible Body Dynamics)

- A. Shafts modeled as flexible using beam elements
- B. Flexible bodies can be attached (such as housing)
- C. Eventually, RecurDyn/Durability, RecurDyn/Acoustics can be used

4) NVH analysis

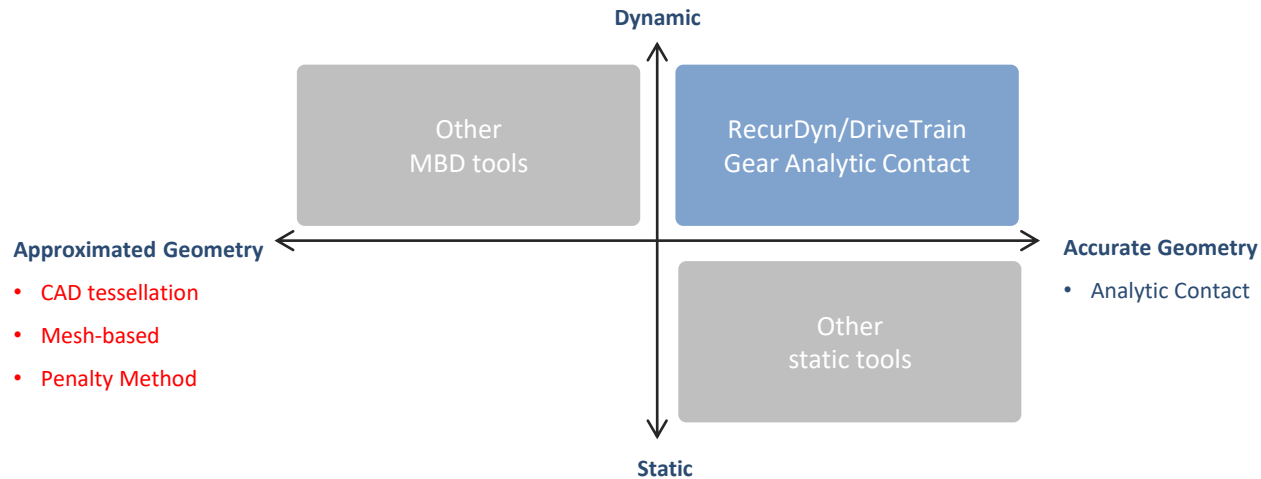
- A. Order tracking analysis using Campbell diagram



2. 6 advantages of RecurDyn/DriveTrain (1)

1 Accurate Gear Analytic Contact

- Since Transmission Error is a very small value (μm), accurate contact calculation is crucial.
- FunctionBay provides accurate Gear Analytic Contact through technical cooperation with Gleason/KISSsoft
- KISSsoft is a program for sizing, optimizing and recalculating designs for machine components such as gears, shafts and bearings, screws, springs, joining elements and belts.
- Advantages of Gear Analytic Contact of RecurDyn/DriveTrain
 - Theory-based contact calculation considers detailed gear design parameters
 - Considers deformation of gear teeth
 - Considers tolerance of gear teeth
 - Contact available in dynamic simulation



2. 6 advantages of RecurDyn/DriveTrain (2)

2
Easy modeling
with specialized UI

- Easy drivetrain modeling (gears/bearings/shafts) through specialized dialog
- Supports detailed gear design through built-in KISSsoft UI



CylindricalGear [Current Unit : N/kg/mm/s/deg]

General Cylindrical Gear

Assembly Reference Point (Gear1) Gear Normal Direction

Assembly Reference Direction Use KISSsoft Z12 Module Files

Gear Geometry

Normal Module Gear Type

Pressure Angle at Normal Section Helix Angle at Reference Circle

Gear	No. of Teeth	Face Width	Profile Shift Coefficient	Details	Profile	Tolerance	Modification	Material
1	25	44.	0.2485	...	Factors	...	...	18CrNiMo7-6, Case...
2	76	44.	-0.2485	...	Factors	...	...	18CrNiMo7-6, Case...

Gear Pair

Pair	Base Gear	Action Gear	Center Distance	Backlash	Axial Offset	Rot. Angle	Contact	Meta Model	Import	Export	KISSsoft UI
1	1	2	303.	Calc. 0.346647...	0.	0.	...	...	...	...	...

Gear Force Type Each Rendering Force Display

KISSsoft Gear Modeler



2. 6 advantages of RecurDyn/DriveTrain (2)

2
Easy modeling
with specialized UI

- Easy drivetrain modeling (gears/bearings/shafts) through specialized dialog
- Supports detailed gear design through built-in KISSsoft UI



Bearing [Current Unit : N/kg/mm/s/deg]

General Bearing

Center Point Normal Direction

Bearing Library

Bearing Type

Inner Diameter(Di) (mm) Row Distance(a) (mm)

Outer Diameter(Do) (mm) Dynamic Load Rating(C) (N)

Nominal Width(B) (mm) Static Load Rating(C0) (N)

Number of Balls/Rollers(Z)

Ball/Roller Diameter(Dw) (mm)

Reference Diameter(Dpw) (mm)

Radius of Curvature, Inner Ring(ri) (mm)

Radius of Curvature, Outer Ring(ro) (mm)

Radius of Curvature, Roller(Rp) (mm)

Axial Clearance(mm)

Diametral Clearance(mm)

Contact Angle(alpha) (rad)

Effective Roller Length(Lwe) (mm)

Distance(Lwc) (mm)

Each Rendering Force Display

Approximation using Load Ratings

Dimension Info

Damping Characteristic

OK Cancel

KISSsoft Bearing Modeler



2. 6 advantages of RecurDyn/DriveTrain (2)

2
Easy modeling
with specialized UI

- Easy drivetrain modeling (gears/bearings/shafts) through specialized dialog
- Supports detailed gear design through built-in KISSsoft UI



Shaft [Current Unit : N/kg/mm/s/deg]

General Shaft

Sections

No	L	Ro	Ri	Ref. Element Size	Property	Material
1	100.	25	10	50	Tube	...
2	150	50	10	50	Tube	...
3	100	50	0	50	Rod	...
4	100	25	0	50	Rod	...
5	50	200	0	50	Rod	...

Add
Insert
Delete
Dimension Info.
FDR

Use CoAxial Shaft for End Section

No	L	Ro	Ri	Ref. Element Size	Radius	Angle	Property	Material	FDR
1	50	30	0	50	150	0	Rod	...	0
2	50	30	0	50	150	120	Rod	...	0
3	50	30	0	50	150	240	Rod	...	0

Add
Insert
Delete
Dimension Info.

Material Update for All

Import Export

OK Cancel

KISSsoft Shaft Modeler



2. 6 advantages of RecurDyn/DriveTrain (2)

3

Various bearing libraries

- 15 different types of bearings (ISO/TS 16281)
- Provides bearing database of 8 global brands
- Bearing creation with tens of thousands of libraries



Bearing Types	Bearing Section View	Bearing Types	Bearing Section View	Bearing Types	Bearing Section View
Deep groove ball bearing (Single row)		Cylindrical roller bearing (Single row, Full complement)		Needle cage	
Angular contact ball bearing (Single row)		Cylindrical roller bearing (Double row)		Thrust needle cage	
Four point bearing		Cylindrical roller bearing (Double row, Full complement)		Tapered roller bearing (Single row)	
Deep groove thrust ball bearing (One sided)		Axial cylindrical roller bearing		Spherical roller bearing	
Cylindrical roller bearing (Single row)		Needle roller bearing (w ith/w ithout internal ring)		Axial spherical roller bearing	



2. 6 advantages of RecurDyn/DriveTrain (3)

4 Entire system modeling

- Simulates behavior of entire system, not a component
- Understands the interaction between each element and improves it
- Assemblies including housing can be modeled as flexible bodies using MFBD technology



5 Transient Analysis using Dynamic Solver

- The most relevant transmission error measurement for noise and vibration predictions are the dynamic type. ¹⁾
 - The Dynamic Transmission Error needs to be measured under the environment where gear, bearing, shaft and housing are included in model
- In particular, robust transient simulation is required for the high speed system
- Various causes of gear misalignment can be simulated:
 - Initial assembly error, shaft deformation, bearing stiffness, housing deflection

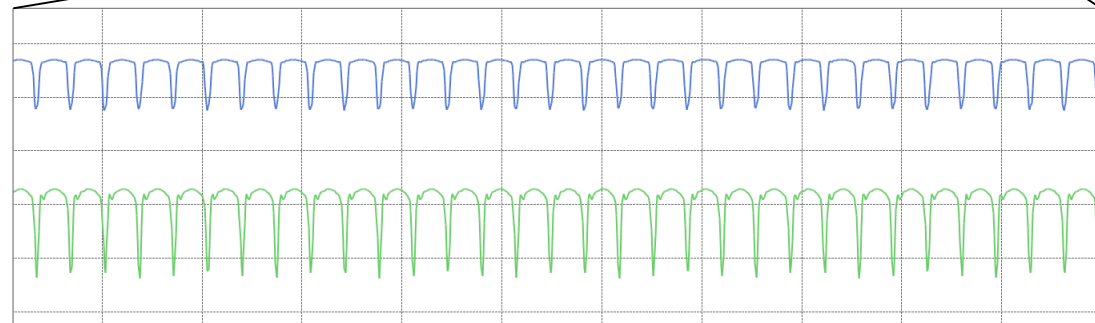
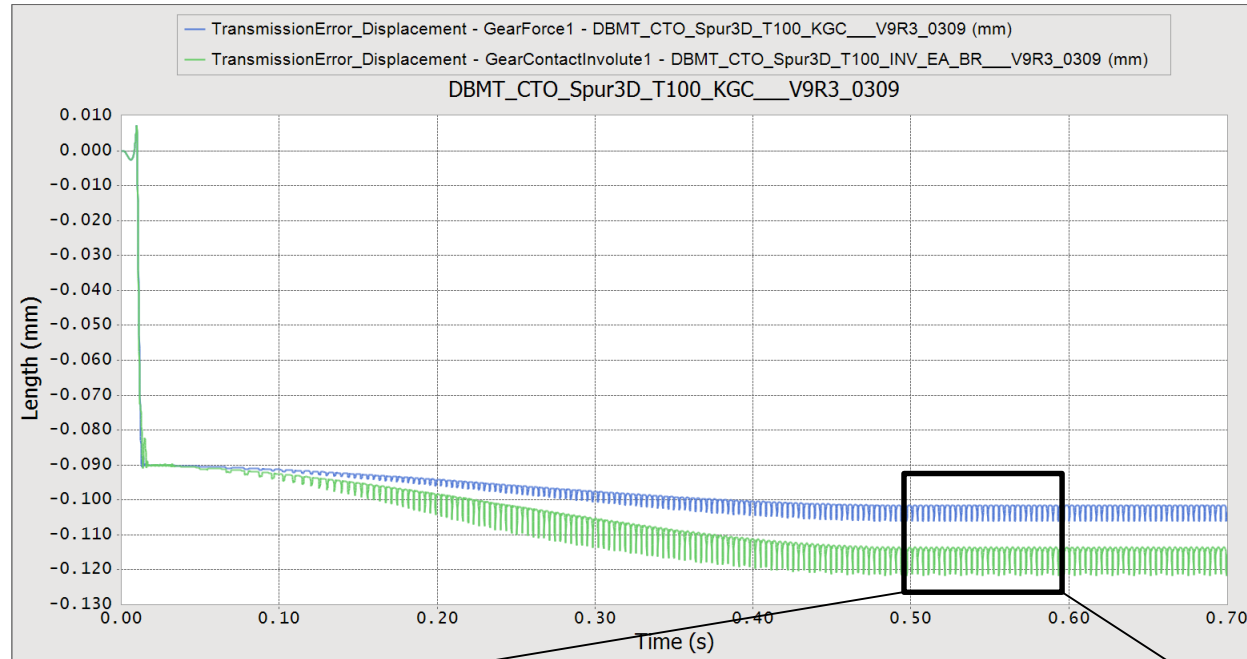
¹⁾ GEAR NOISE AND VIBRATION– A LITERATURE SURVEY, 2001, Mats Åkerblom

2. 6 advantages of RecurDyn/DriveTrain (4)

6

Various
Post-processing
functions

- Check the transmission errors

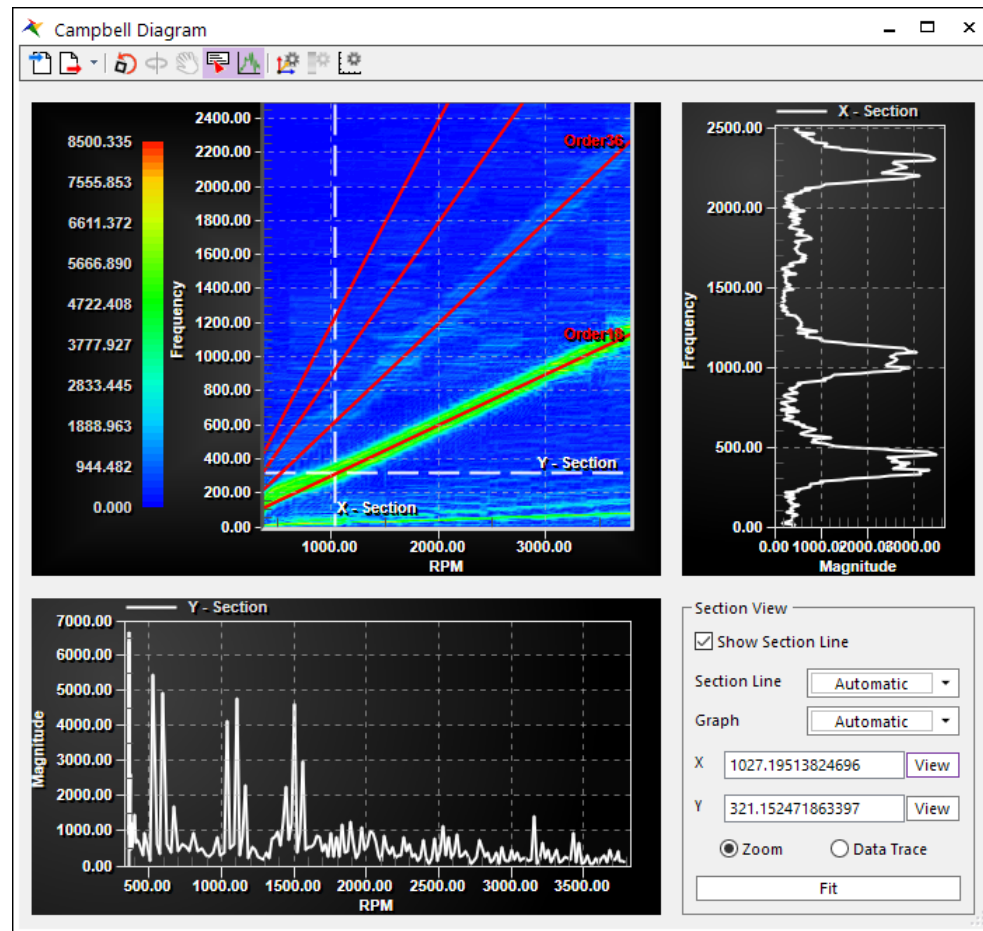


2. 6 advantages of RecurDyn/DriveTrain (4)

6

Various
Post-processing
functions

- Campbell Diagram (Order Tracking Analysis, etc.)
- Identify frequencies of major contributions to vibration/noise.
- Diagnose which part of system to address.

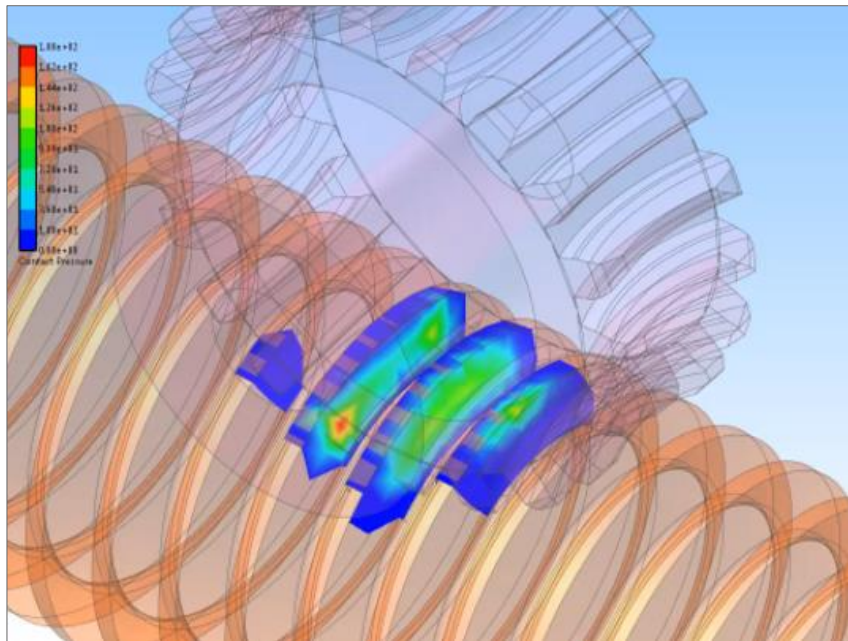


2. 6 advantages of RecurDyn/DriveTrain (4)

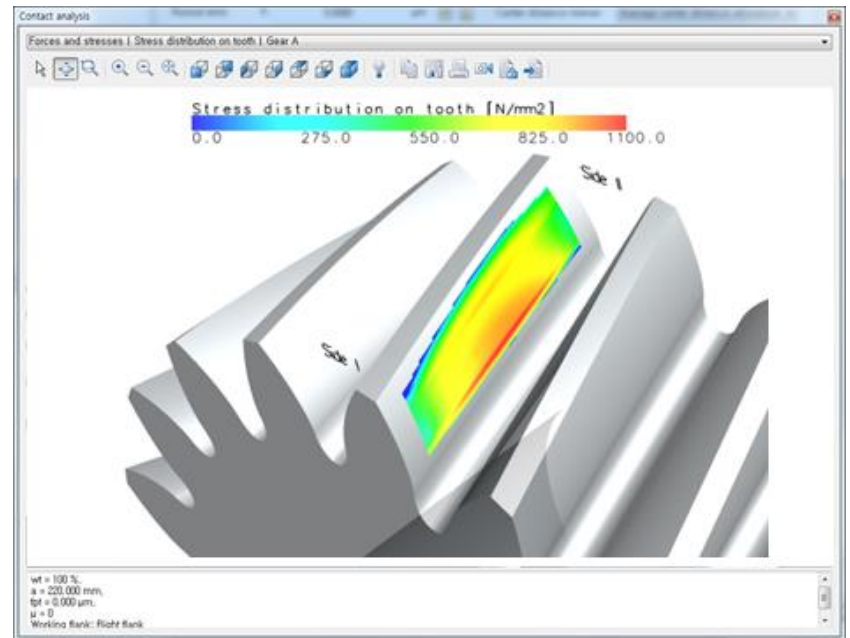
6

Various
Post-processing
functions

- Review various results such as contact pressure, tooth stress, and deformation
- Check the effect of the gear backlash
- Review the vibration of the system to analyze the rattle and whine noise
- Deformation and stress of the shaft

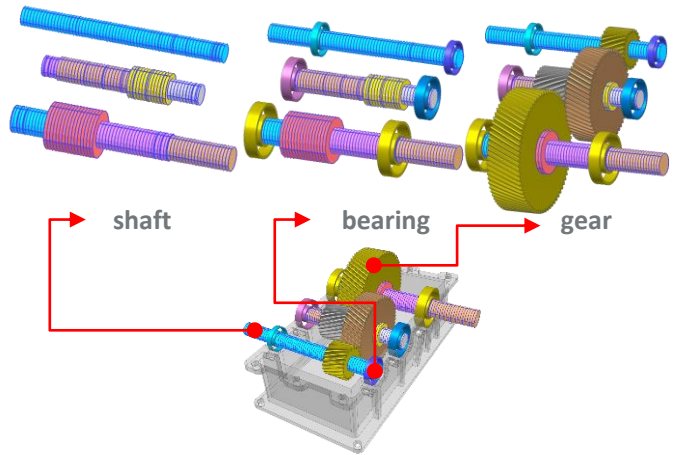


Contact Pressure



Tooth Stress

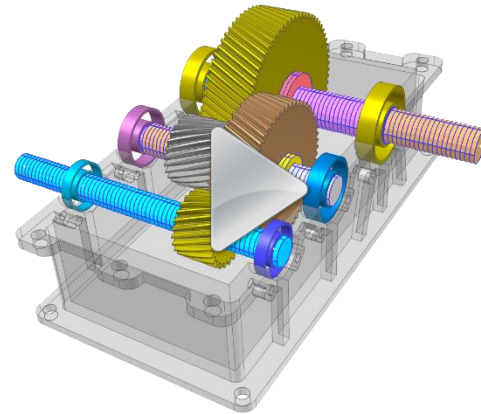
3. Simulation process using RecurDyn/DriveTrain



1

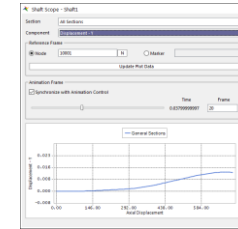
Modeling

Build components (Shaft, Bearing, Gear) and Drivetrain system

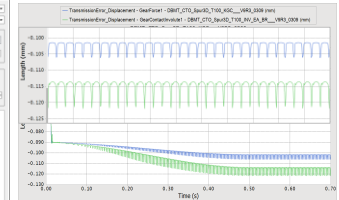


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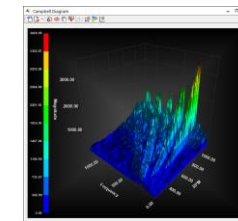
Simulation



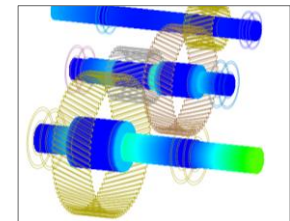
Shaft bending



Transmission Error



Campbell Diagram

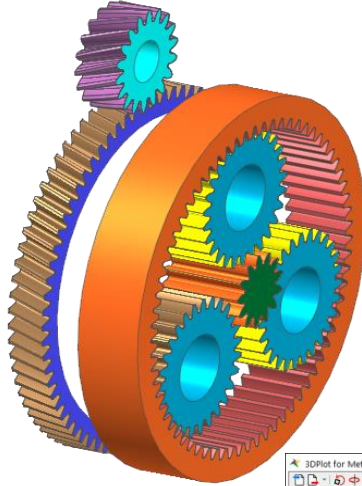
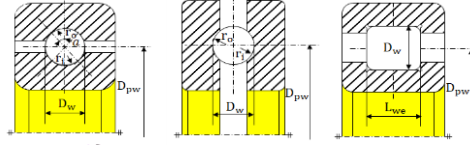
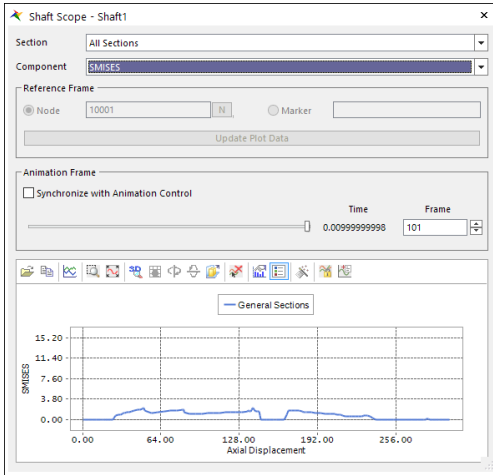
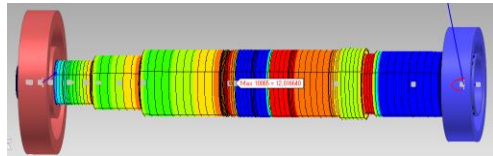
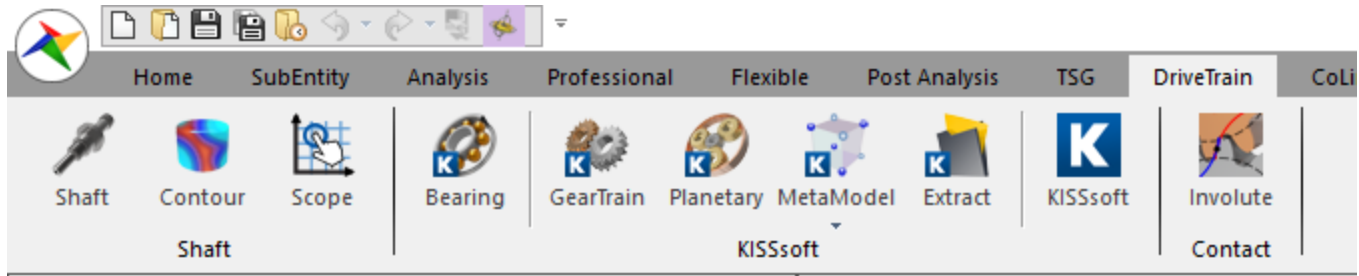


Animation

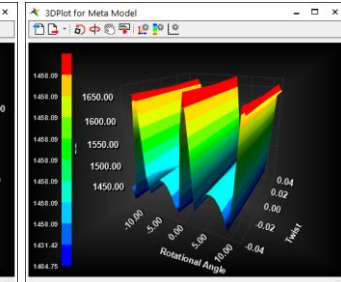
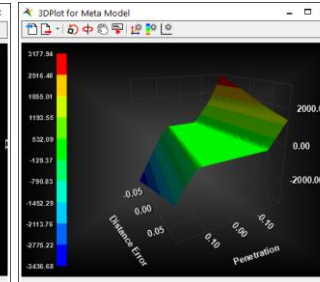
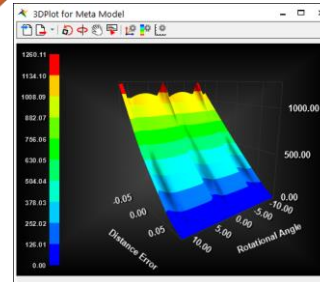
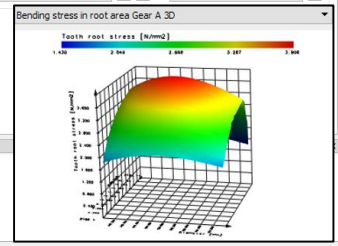
3

Post-processing

4. Main features

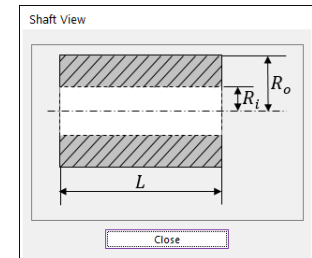
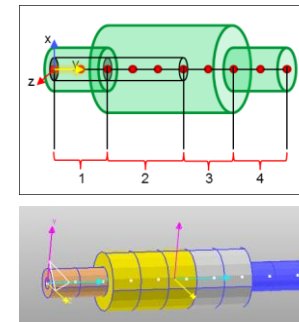
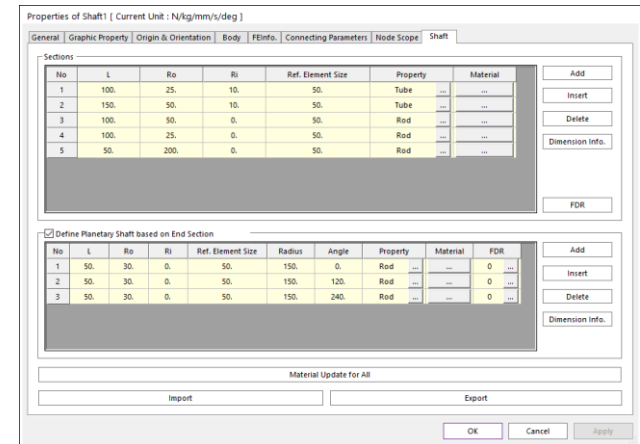
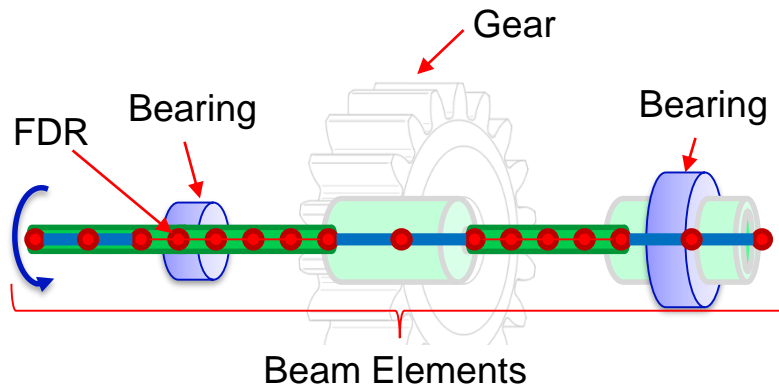
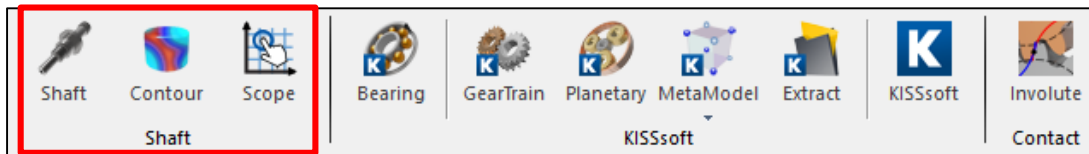


Parameter	Value	Unit
Normal module m_n	1,5000	mm
Pressure angle α	20,0000	°
Helix angle β	25,0000	°
Center distance a	48,9000	mm
Module m	16	
Pressure angle α	43	
Face width b	14,0000	mm
Center distance a	-0,2709	
Number of teeth z	8	



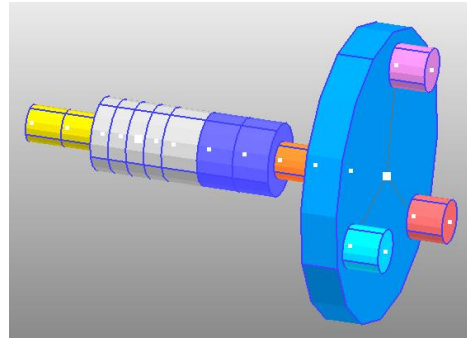
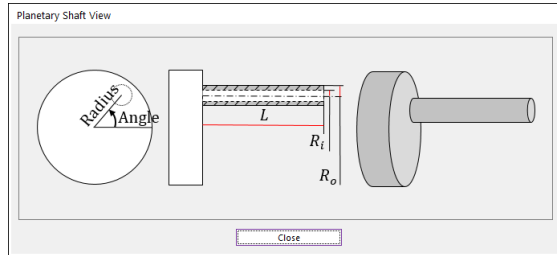
5. RecurDyn/DriveTrain – Shaft (1)

1. Intuitive shaft modeler for easy and convenient modeling
2. Flexible shaft using beam to calculate the deformation and torsion
3. 3D visualization of the beam shape based on beam properties
4. Automatic creation of rigid RBE (FDR) elements (at the point where bearings and gears are engaged)



5. RecurDyn/DriveTrain - Shaft (2)

5. Support Planetary Shaft modeling for planetary gear



Properties of Shaft1 [Current Unit : N/kg/mm³/deg]

General | Graphic Property | Origin & Orientation | Body | FInfo | Connecting Parameters | Node Scope | Shaft

Sections

No	L	Ro	Ri	Ref. Element Size	Property	Material
1	100.	25.	10.	50.	Tube	---
2	150.	50.	10.	50.	Tube	---
3	100.	50.	0.	50.	Rod	---
4	100.	25.	0.	50.	Rod	---
5	50.	200.	0.	50.	Rod	---

Define Planetary Shaft based on End Section

No	L	Ro	Ri	Ref. Element Size	Radius	Angle	Property	Material	FDR
1	50.	30.	0.	50.	150.	0.	Rod	---	0
2	50.	30.	0.	50.	150.	120.	Rod	---	0
3	50.	30.	0.	50.	150.	240.	Rod	---	0

Material Update for All

Import Export

OK Cancel Apply

6. Supports 'shaft scope' to intuitively check the shaft deformation and other results

Shaft Scope - Shaft1

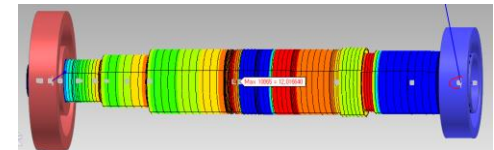
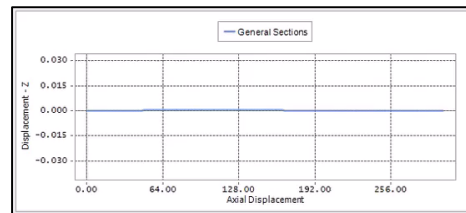
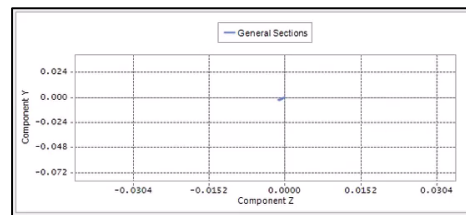
Section: All Sections

Component: SMISES

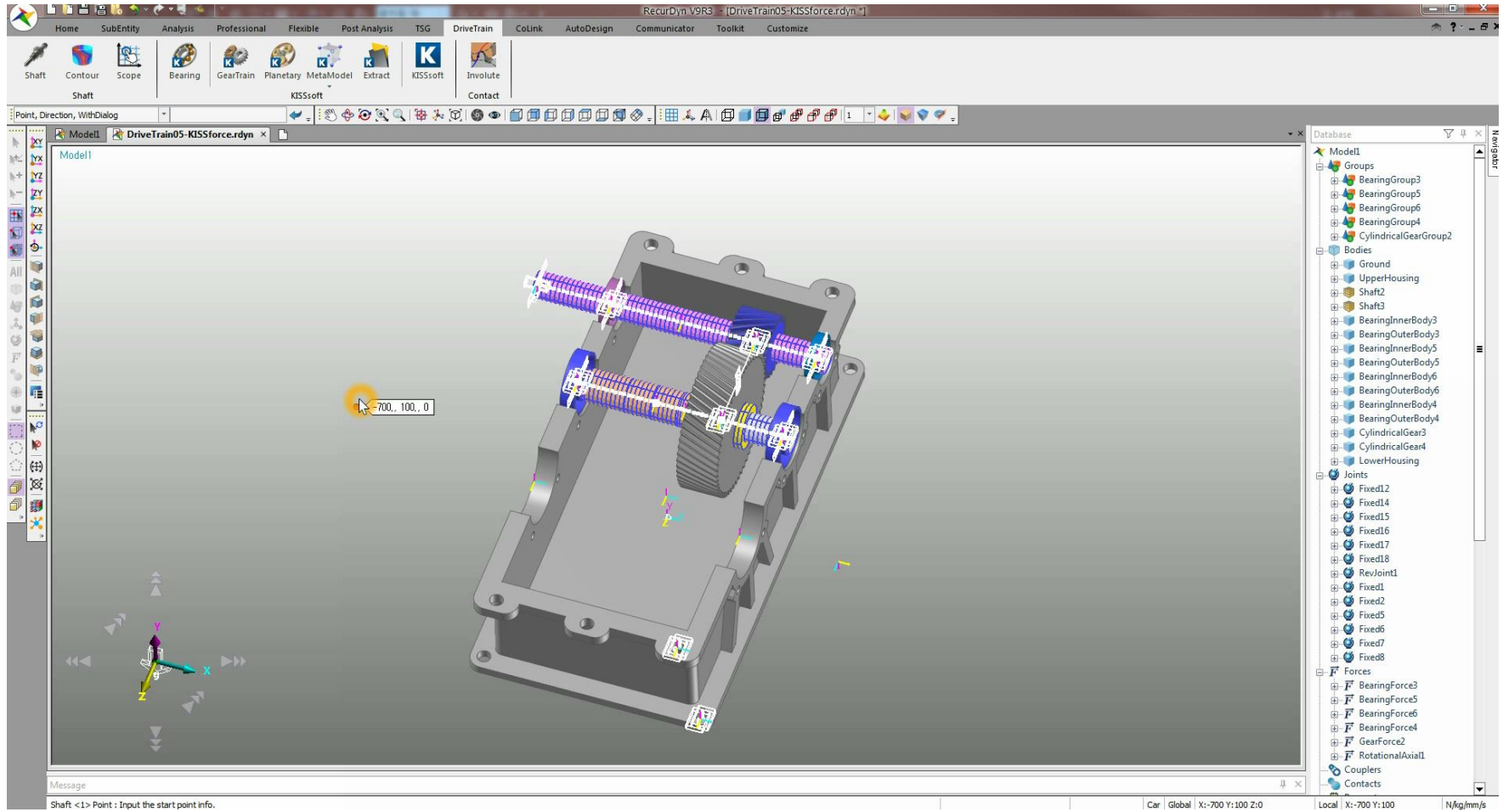
Reference Frame: 10001 N

Animation Frame: Synchronize with Animation Control

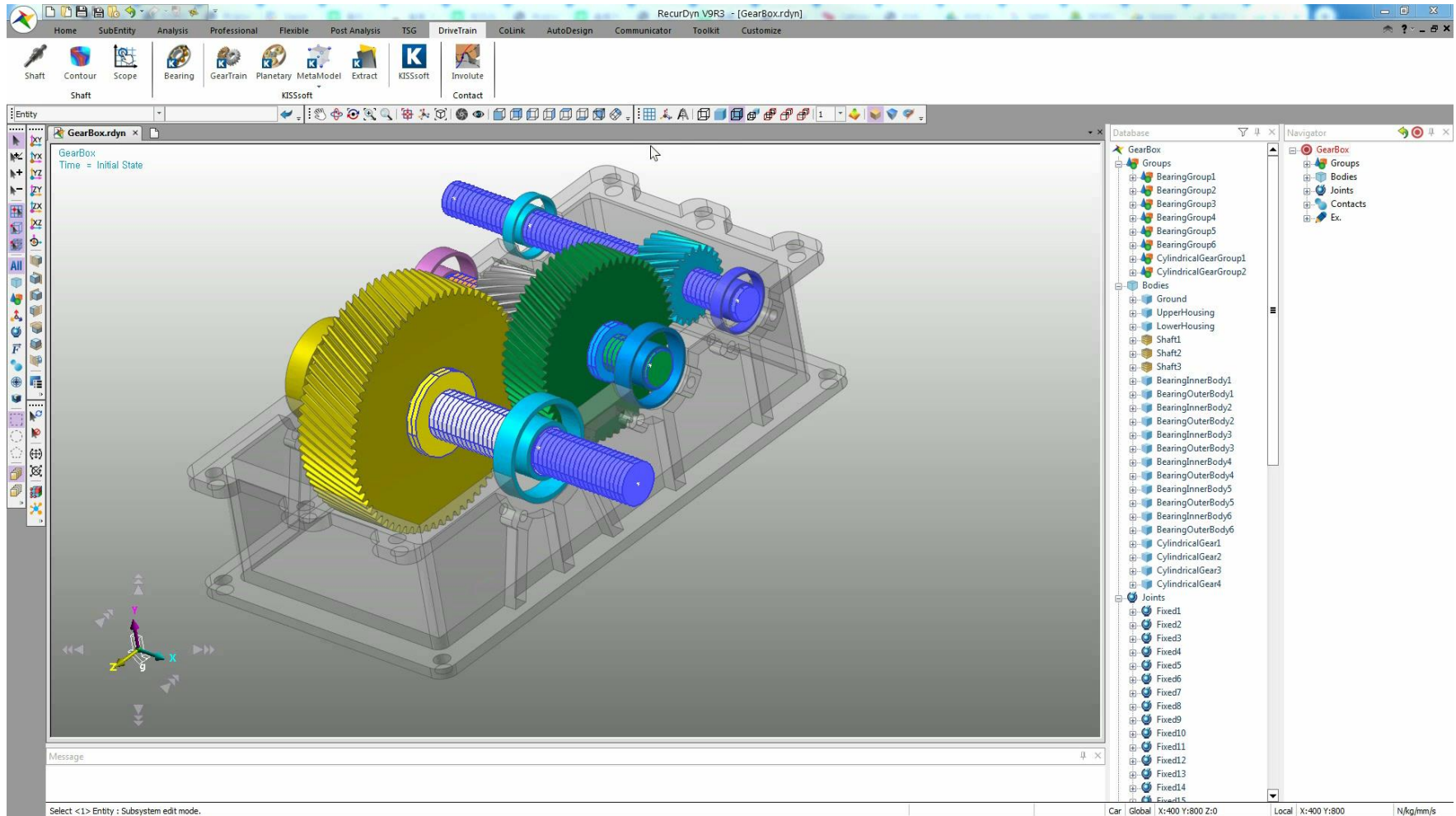
Time: 0.069999999995 Frame: 29



5. RecurDyn/DriveTrain - Shaft (Modeling Demo)

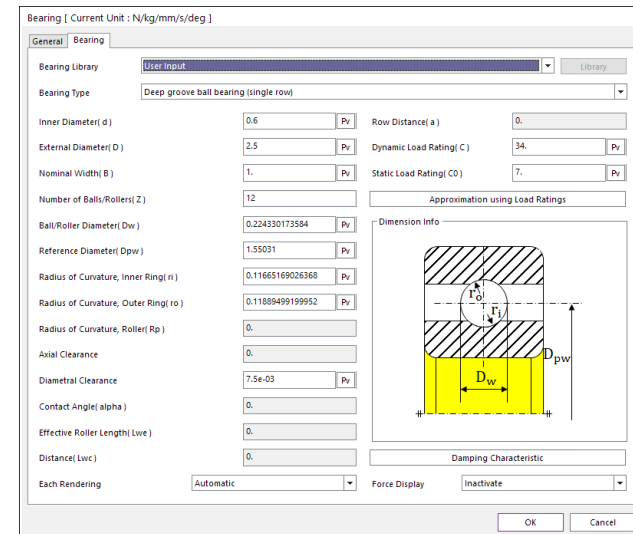
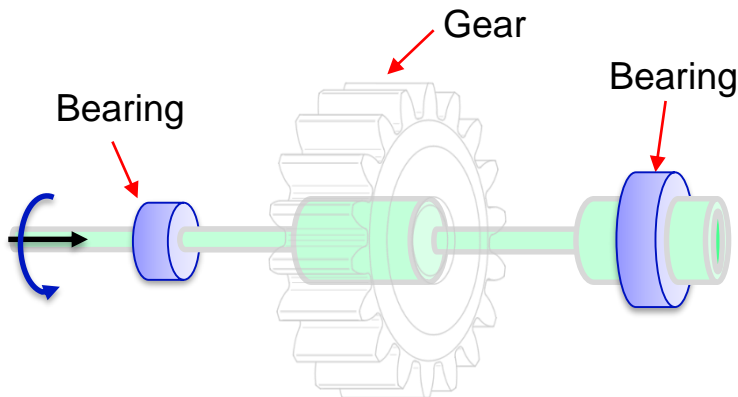
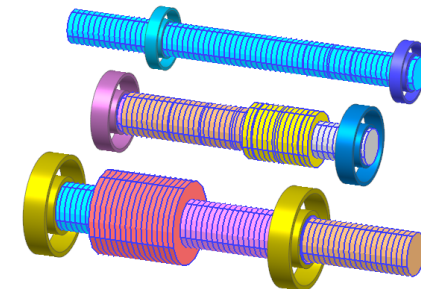
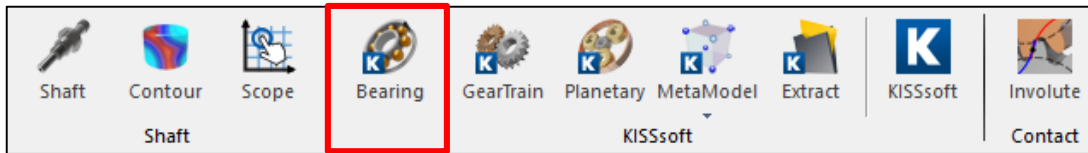


5. RecurDyn/DriveTrain – Shaft (Post-Processing Demo)



6. RecurDyn/DriveTrain – BearingKS (1)

1. Intuitive bearing modeler
2. Bearing creation using user input parameters
3. Estimates internal geometry parameters of bearing based on diameter and load rating of ball and roller
4. Provides position, velocity, acceleration, and reaction force of bearing at each point in time of analysis



6. RecurDyn/DriveTrain – BearingKS (2)

5. 15 different types of bearings (ISO/TS 16281)

6. Provides bearing database of 8 global brands

- 1) SKF, IBC, TIMKEN, KOYO, KRW, NSK, FAG, INA
- 2) Bearing creation with tens of thousands of libraries

Bearing Types	Bearing Section View	Bearing Types	Bearing Section View	Bearing Types	Bearing Section View
Deep groove ball bearing (Single row)		Cylindrical roller bearing (Single row, Full complement)		Needle cage	
Angular contact ball bearing (Single row)		Cylindrical roller bearing (Double row)		Thrust needle cage	
Four point bearing		Cylindrical roller bearing (Double row, Full complement)		Tapered roller bearing (Single row)	
Deep groove thrust ball bearing (One sided)		Axial cylindrical roller bearing		Spherical roller bearing	
Cylindrical roller bearing (Single row)		Needle roller bearing (with/without internal ring)		Axial spherical roller bearing	



Bearing Library

Bearing Type: **Deep groove ball bearing (single row)**

Diameter: **Deep groove ball bearing (single row)**

Bearing: **Deep groove ball bearing (single row)**

Internal Clearance: **Deep groove ball bearing (single row)**

- Angular contact ball bearing (single row)
- Four point bearing
- Deep groove thrust ball bearing (one sided)
- Cylindrical roller bearing (single row)
- Cylindrical roller bearing (single row, full complement)
- Cylindrical roller bearing (double row)
- Cylindrical roller bearing (double row, full complement)
- Axial cylindrical roller bearing
- Needle roller bearing (with/without internal ring)
- Needle cage
- Thrust needle cage
- Taper roller bearing (single row)
- Spherical roller bearings
- Axial spherical roller bearings

Bearing Library

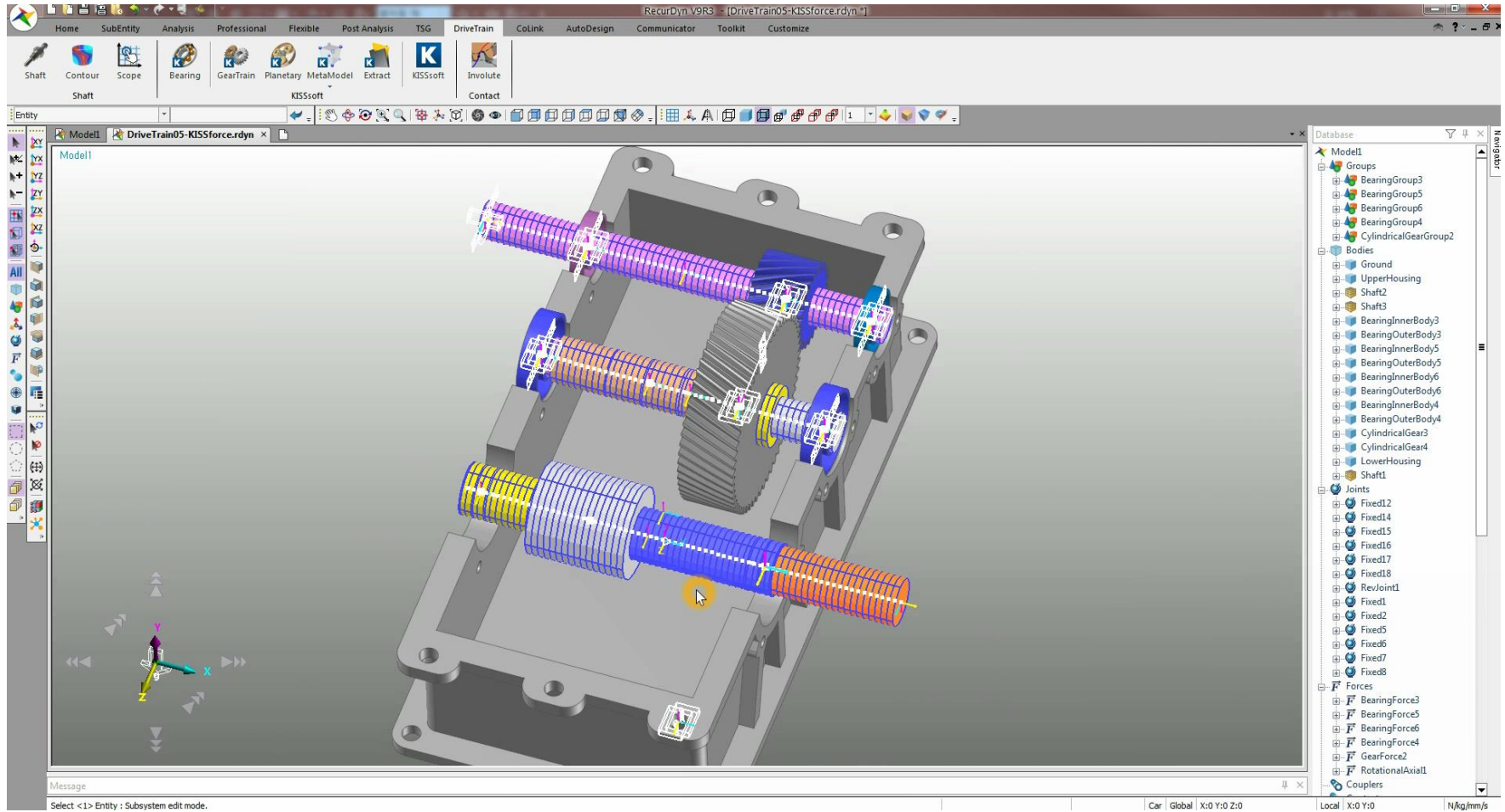
Bearing Type: **Cylindrical roller bearing(double row)**

Diameter: Inside Outside mm

Bearing: **Koyo NN3005K (d=25.000 mm, D=47.000 mm, B=16.000 mm)**

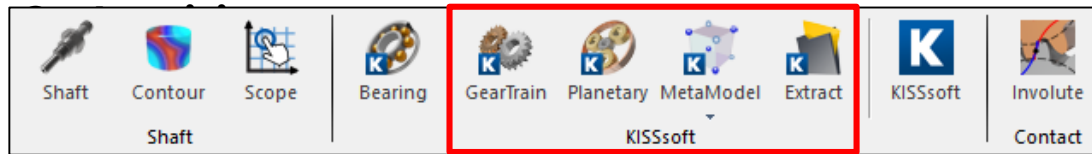
Internal Clearance: **Koyo NN3005K (d=25.000 mm, D=47.000 mm, B=16.000 mm)**

6. RecurDyn/DriveTrain – BearingKS (Modeling Demo)



7. RecurDyn/DriveTrain – GearKS (1)

1. Gear Analytic Contact specialized for gear analysis (SMP (Symmetric Multiprocessing) up to 16 cores is supported)
2. Provides various gear analysis results including Transmission Error (TE)



Properties of CylindricalGearGroup1 [Current Unit : N/kg/mm/s/deg]

General Cylindrical Gear

Assembly Reference Point (Gear1) 0, 117.38, -43.9499999999999 Pt Gear Normal Direction 0, 0, 1. Pt

Assembly Reference Direction 0, -1, 0 Pt Use KISSsoft Z12 Module Files Z12 Module Files

Gear Geometry

Normal Module 2.5 Gear Type Helix Left Hand

Pressure Angle at Normal Section 20. Helix Angle at Reference Circle 20.

Gear	No. of Teeth	Face Width	Profile Shift Coefficient	Details	Profile	Tolerance	Modification	Material
1	18	20.5	0.267	...	Diameter	...	...	18CrNiMo7-6, Case...
2	71	17.	-0.659	...	Diameter	...	...	18CrNiMo7-6, Case...

Add Delete Insert

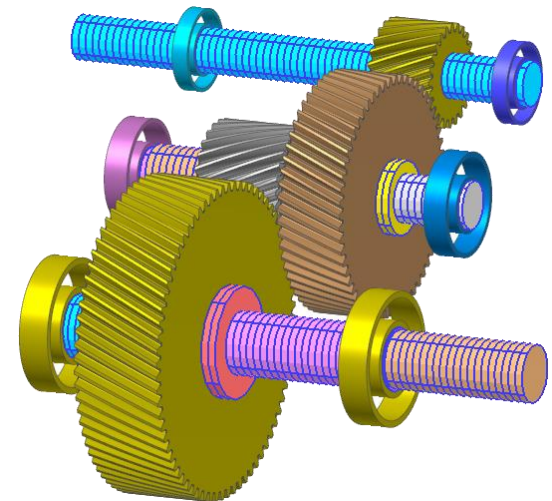
Gear Pair

Pair	Base Gear	Action Gear	Center Distance	Backlash	Axial Offset	Rot. Angle	Contact	Meta Model	Import	Export	KISSsoft UI
1	1	2	117.3802... Calc.	6.376226... Calc.	0.	0.	...	...	...	...	...

Add Delete Insert

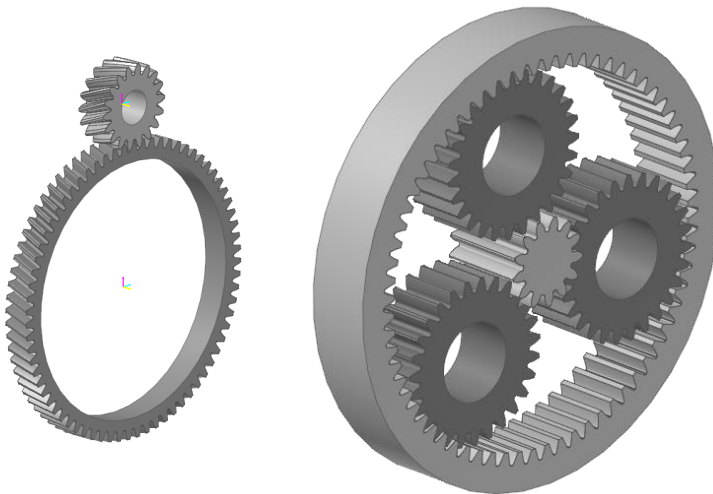
Gear Force Type KISSsoft Force Each Rendering Automatic Force Display Inactivate

OK Cancel Apply



7. RecurDyn/DriveTrain – GearKS (2)

- 4. Supports Spur Gear, Helical Gear, and Planetary Gear
- 5. Supports gear geometry and detailed tooth modeling
- 6. Provides various Tooth Tolerance libraries and Material libraries
- 7. Automatic calculation of gear backlash based on inputs



[Gear 1] Material

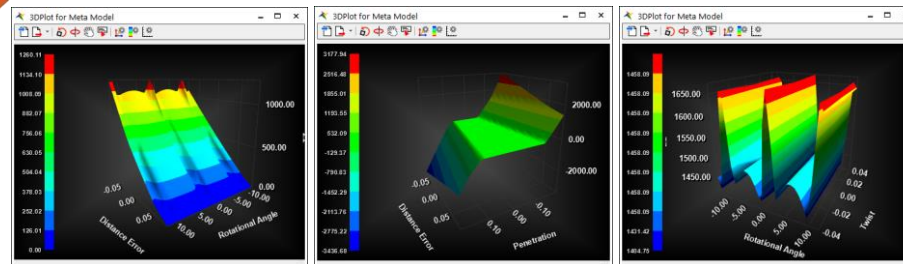
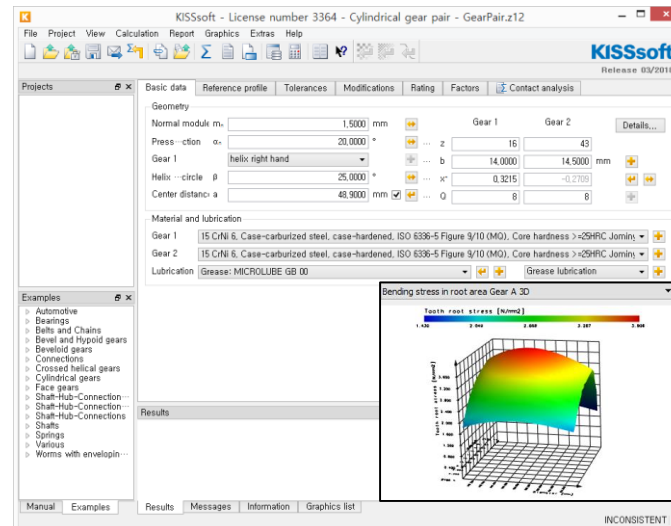
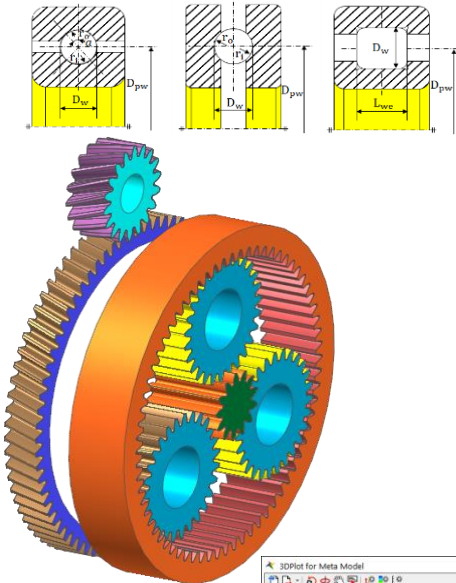
Label	Material...	Comment	Material Type	Type of Treatment	Surface Hardness	Unit of the hardness
115Mn30 (95Mn28) (1)	1.0715	ISO 6336-5 Figure 5/6 (IM)	Free Cutting Steel	Untreated	103.0000	HBW
115Mn30 (95Mn28) (2)	1.0715	ISO 6336-5 Figure 9/10 (IM)	Free Cutting Steel	Case Hardened	700.0000	HV
115MnPb30	1.0718	ISO 6336-5 Figure 9/10 (IM)	Free Cutting Steel	Case Hardened	57.0000	HRC
115MnPb37 (95MnPb...	1.0737	ISO 6336-5 Figure 5/6 (IM)	Free Cutting Steel	Untreated	112.0000	HBW
14 Ni 6	1.5622	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Structural Steel	Case Hardened	62.0000	HRC
14NiCrMo 13-4	1.6657	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
15 CrNi 6	1.5919	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
15 NiCr 13	1.5752	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
16 MnCr 5 (1)	1.7131	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	59.0000	HRC
16 MnCr 5 (2)	1.7131	ISO 6336-5 Figure 13b/14a (IM)	Case Hardening Steel	Nitrided	710.0000	HV
17NiCrMo6-4	1.6566	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
18 NiCr 5-4	1.581	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	58.0000	HRC
18CrNi4	1.7243	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
18CrNiMo7-6	1.6587	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	61.0000	HRC
18CrNiMo7-6	1.6587	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	61.0000	HRC
18CrNiMo7-6	1.6587	GOST 21354 ground with possible overheating or grinn...	Case Hardening Steel	Case Hardened	61.0000	HRC
18CrNiMo7-6	1.6587	GOST 21354 rolled, 1p=1, 1p=1, 1p=0,9	Case Hardening Steel	Case Hardened	61.0000	HRC
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 90.0HR15HN; Core 320HB	Nitriding Steel	Nitrided	580.0000	HV
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 87.5HR15HN; Core 320HB	Nitriding Steel	Nitrided	687.0000	HV
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 90.0HR15HN; Core 320HB	Nitriding Steel	Nitrided	580.0000	HV
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 87.5HR15HN; Core 320HB	Nitriding Steel	Nitrided	687.0000	HV
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 90.0HR15HN; Core 320HB	Nitriding Steel	Nitrided	580.0000	HV
2.5% Cr-Steel(No Al...	...	AGMA2001: Surface 87.5HR15HN; Core 320HB	Nitriding Steel	Nitrided	687.0000	HV
20 MnCr 5	1.7147	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
20NiCrMo56-4	1.6571	ISO 6336-5 Figure 9/10 (IM), Core hardness >= 25HRC ...	Case Hardening Steel	Case Hardened	60.0000	HRC
25CrMo4	1.7218	ISO 6336-5 Figure 5/6 (IM)	Through Hardening Steel	Alloyed / through Hardened	207.0000	HBW
25CrMo4	1.7213	ISO 6336-5 Figure 5/6 (IM)	Through Hardening Steel	Alloyed / through Hardened	207.0000	HBW
30 CrNiMo 8 (1)	1.658	ISO 6336-5 Figure 5/6 (IM)	Through Hardening Steel	Alloyed / through Hardened	266.0000	HBW
30 CrNiMo 8 (2)	1.658	ISO 6336-5 Figure 13b/14a (IM)	Through Hardening Steel	Nitrided	670.0000	HV
30CrMoV9	1.7707	ISO 6336-5 Figure 13a/14a (IM)	Nitriding Steel	Nitrided	800.0000	HV
31 CrMo 12	1.8515	ISO 6336-5 Figure 13a/14a (IM)	Nitriding Steel	Nitrided	800.0000	HV
31 CrMoV9	1.8519	ISO 6336-5 Figure 13a/14a (IM)	Nitriding Steel	Gas Nitrided	800.0000	HV

Close

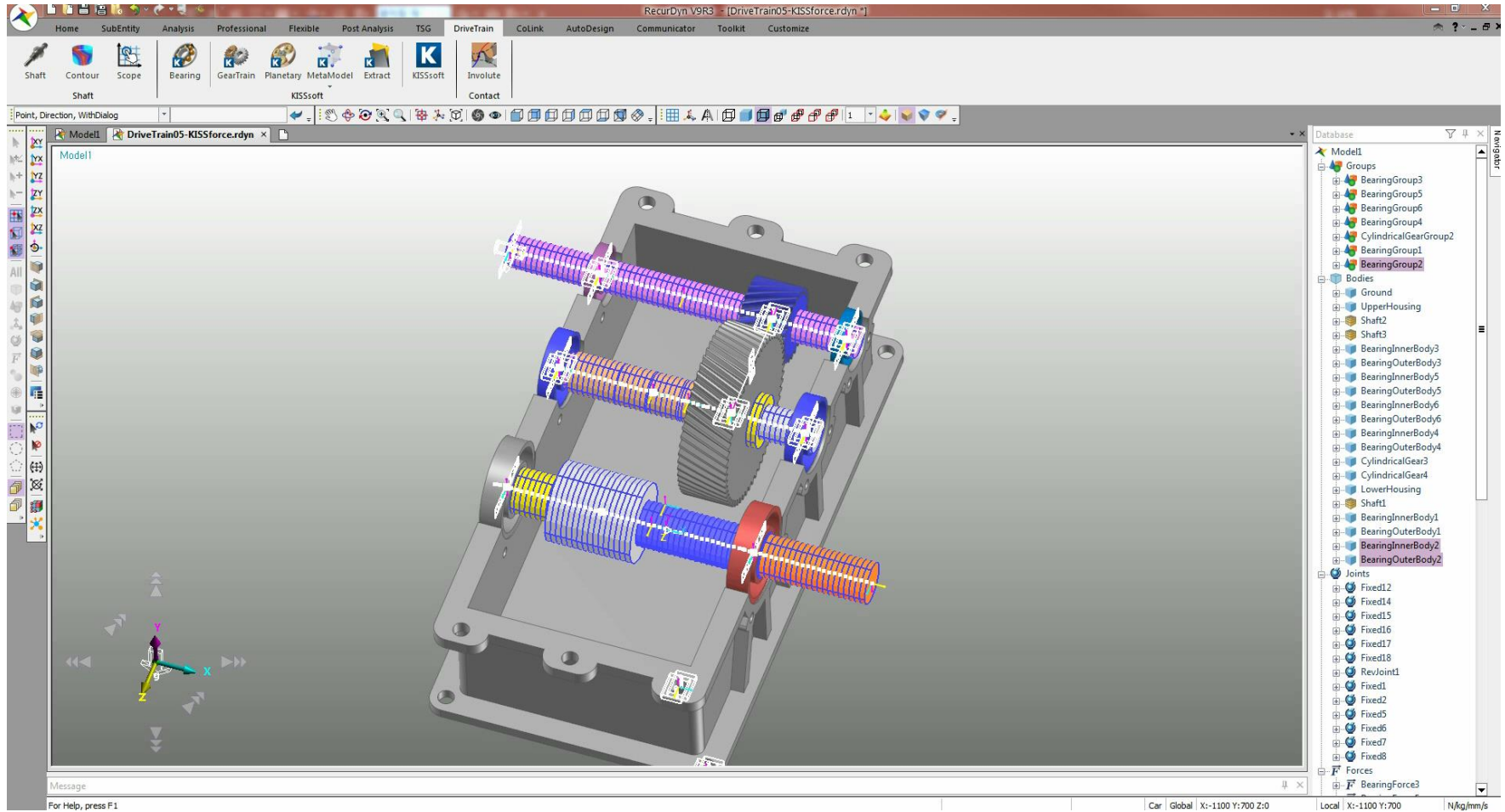
7. RecurDyn/DriveTrain – GearKS (3)

8. Detailed modeling/analysis/post-processing through built-in KISSsoft UI

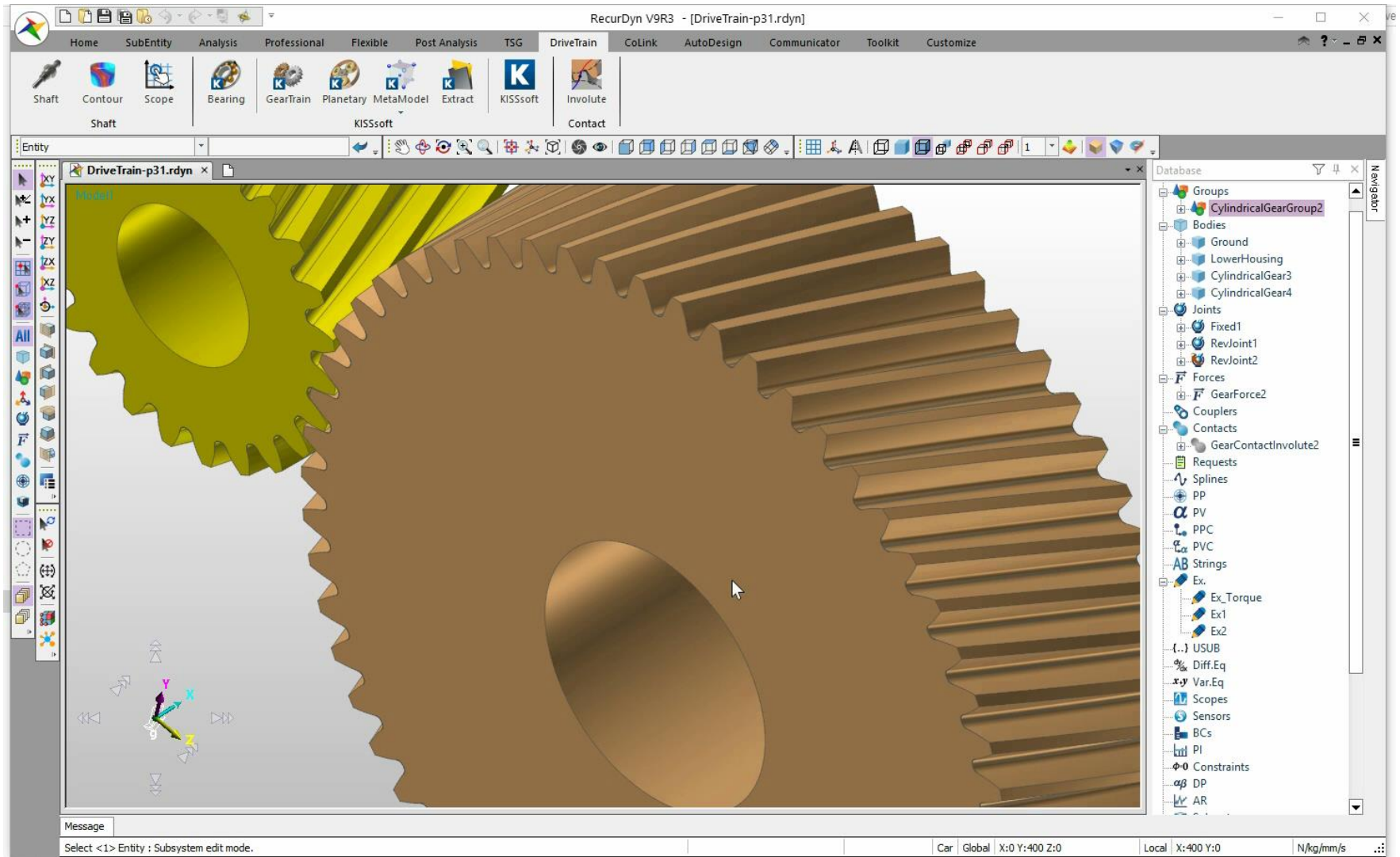
- Precise gear design with parameters used for actual gear design
- Interoperability of the gear models between KISSsoft and RecurDyn
- Supports gear static analysis
- Various results such as stress distribution on the gear tooth surface



7. RecurDyn/DriveTrain – GearKS (Modeling Demo)



8. Embedded KISSsoft GUI Demo

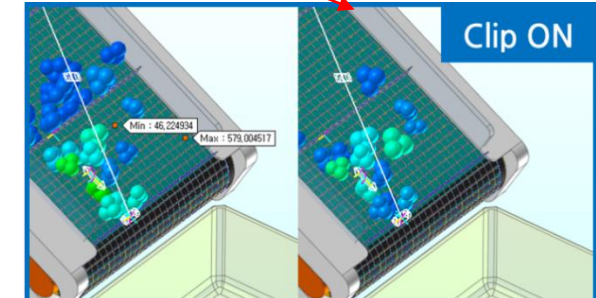
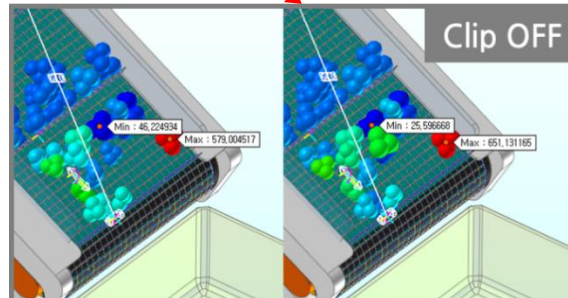
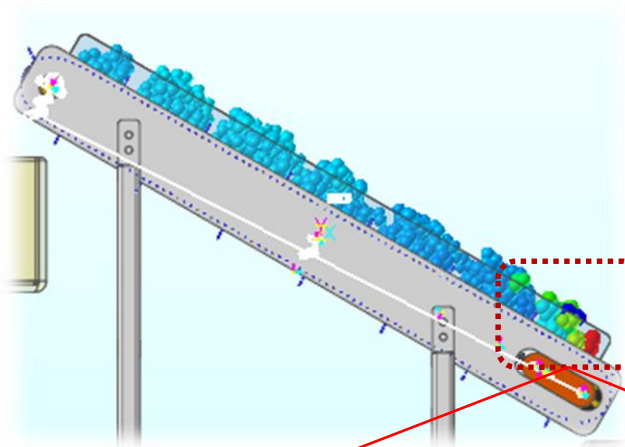
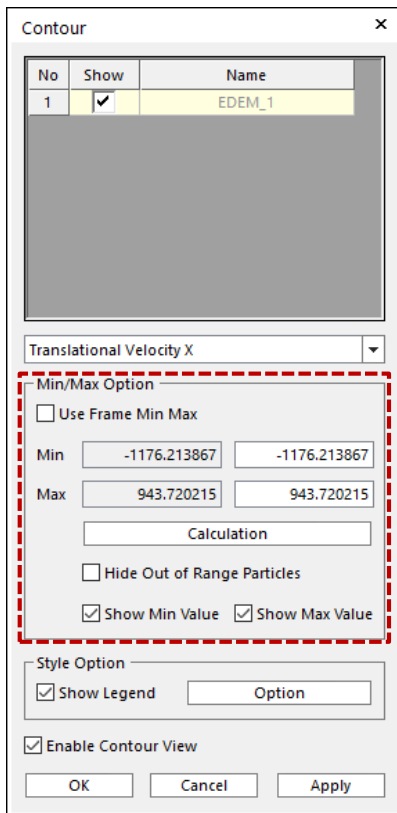
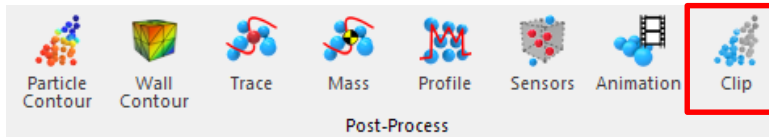




Other Toolkits

1. Particleworks I/F, EDEM I/F – Clip Particles

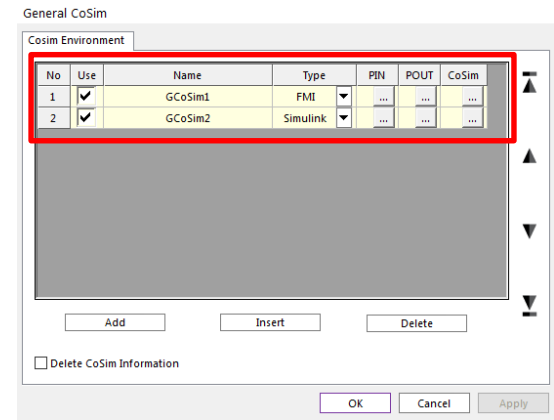
Hide particles that fall outside the user-specified range of results during animation in Particleworks I/F and EDEM I/F



2. RecurDyn/Control & RecurDyn CoLink

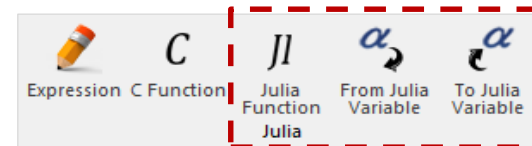
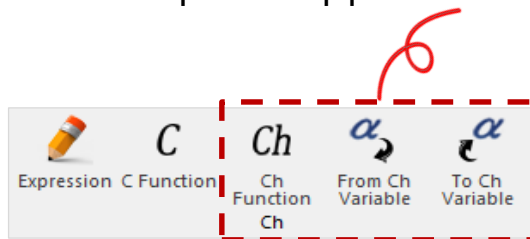
1. Control

- 1) Direct interface with AMESim is obsoleted
 - A. FMI (Functional Mock-up Interface) can be used instead
- 2) Multi-Cosim supports Simulink

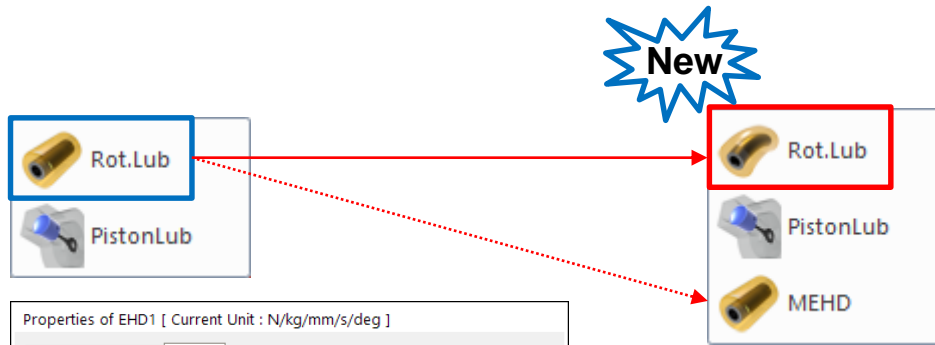


2. CoLink

- 1) Ch-Script is obsoleted
- 2) Julia-Script is supported instead



3. RecurDyn/EHD – Rotational Lubrication (1)



Properties of EHD1 [Current Unit : N/kg/mm/s/deg]

General Connector EHD

EHD Solver Type RDEHD MEHD

Bearing ID (MEHD)

Journal Diameter Pv

Bearing Width Pv

Lubrication Gap [%] [L] Pv

Dynamic Viscosity[Pa.s] Pv

Mesh Grid Setting

RDEHD Additional Options

RDEHD Solver Setting

MEHD Solver Output Setting

Show Pressure Contour

Contour Setting

Output Data Export

Output Reference Marker M

Force Display

Scope OK Cancel Apply

V9R2

Properties of EHD1 [Current Unit : N/kg/mm/s/deg]

General Connector EHD

Shaft Diameter Pv

Bearing Width Pv

Lubrication Gap [%] [L] Pv

Dynamic Viscosity[Pa.s] Pv

Second Shaft Diameter

Mesh Grid Setting

Solver Setting

Additional Options

Consider Shaft Bending & Bearing Local Deformation

Shaft

Patch Set (RFlex) P

Reference Node ID (Start - Mid. - End)

N N N

Bearing

Patch Set (RFlex) P

Reference Node ID N

Profile

Film Thickness

Show Pressure Contour

Contour Setting

Output Data Export

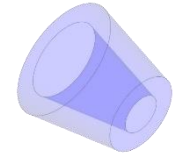
Output Reference Marker M

Force Display

Scope OK Cancel Apply

V9R3

3. RecurDyn/EHD – Rotational Lubrication (2)



Properties of EHD1 [Current Unit : N/kg/mm/s/deg]

General Connector EHD

Shaft Diameter: 53 Pv

Bearing Width: 17. Pv

Lubrication Gap: [%] [L] 6.3e-002 Pv

Dynamic Viscosity[Pa.s]: 3.5e-003 Pv

Second Shaft Diameter: 100.

Mesh Grid Setting

Consider Shaft Bending & Bearing Local Deformation

Shaft

Patch Set (RFlex): Shaft.SetPatch1 P

Reference Node ID (Start - Mid. - End): 1000002 N 1000000 N 1000001 N

Bearing

Patch Set (RFlex): Plate.SetPatch1 P

Reference Node ID: 10001 N

Profile: Film Thickness

Show Pressure Contour

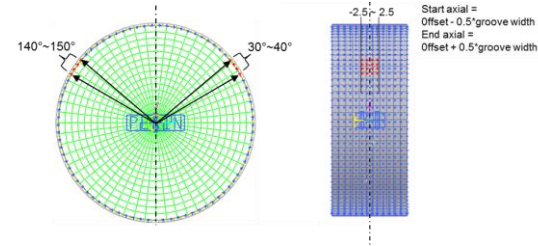
Output Reference Marker: Plate.Marker8 M

Force Display: Action

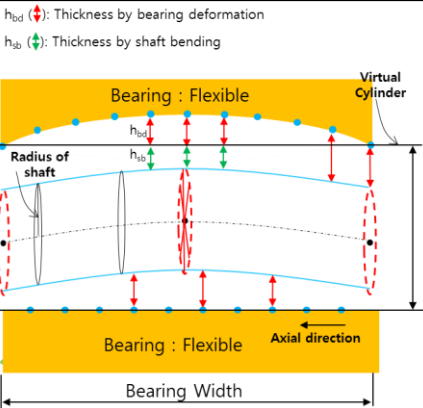
Scope OK Cancel Apply

Cone-shaped EHD
Second Shaft Diameter (Support Rigid Body)

Oil Hole & Groove Effects Setting
(Angle, Axial Position & Range)



Consider Flexibility using Bearing & Shaft RFlex Body
(thickness calculation considering Bearing Deformation, Shaft Bending)



Contour

Pressure Pressure X Velocity

Contour Type: ID Surface

Pressure Type: Hydrodynamic

Min/Max Option: Calculate Min/Max

Minimum Value (F/L^2): 0.

Maximum Value (F/L^2): 7.0734540713917e-003

Scale (F/L^2): 5e-002

Cut Off Pressure (F/L^2): 0.

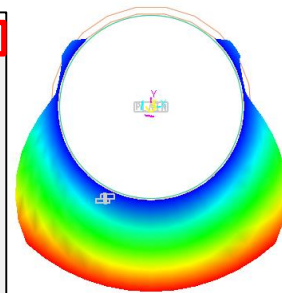
Show Contour Legend

Color Option: Automatic

Color at Minimum Value: Automatic

Color at Maximum Value: Automatic

OK Cancel Apply



Patch set where the force by lubrication is applied

Profile: offset from Bearing Grid Position
Film Thickness: Set Pressure to 0 if bigger than specified value



4. RecurDyn/Chain - User-defined Bushing Position

Properties of PinLink1 [Current Unit : dyn/g/cm/s/deg]

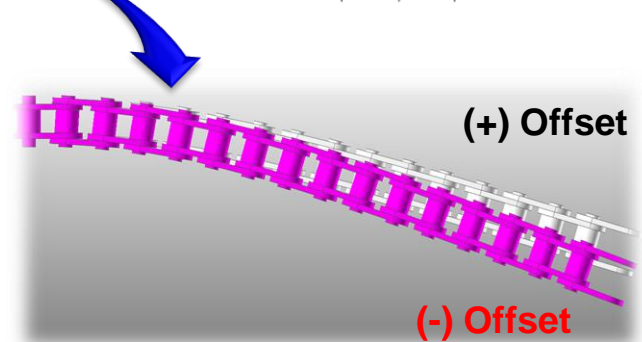
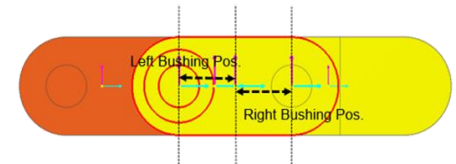
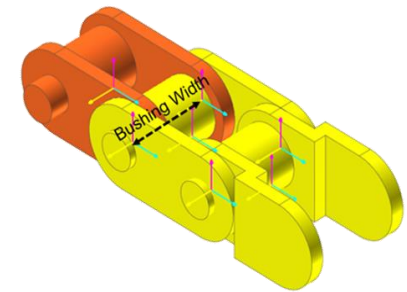
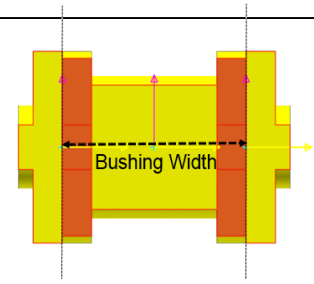
General	Graphic Property	Origin & Orientation	Body	Characteristics
Link Type	General Roller Link	No. of Link Sets	1	
Pitch (P)	6.35	Pv	No. of Strands	1
Roller Diameter (Dr)	3.937	Pv		
Roller Width (Wr)	3.81	Pv		
Width between Roller Link Plate (Wrl)	3.81	Pv		
Thickness of Roller Link Plate (Trl)	0.889	Pv		
Height of Roller Link Plate (Hrl)	5.296	Pv		
Width between Pin Link Plate (Wpl)	5.588	Pv		
Thickness of Pin Link Plate (Tpl)	0.889	Pv		
Height of Pin Link Plate (Hpl)	5.296	Pv		
Pin Diameter (Dp)	2.289	Pv	Pin Length (Lp)	8.26
Dimension Information		Calculator		

V9R2

Properties of PinLink1 [Current Unit : N/kg/mm/s/deg]

General	Graphic Property	Origin & Orientation	Body	Characteristics
Link Type	General Roller Link	No. of Link Sets	1	
Pitch (P)	63.5	Pv	No. of Strands	1
Roller Diameter (Dr)	39.37	Pv		
Roller Width (Wr)	38.1	Pv		
Width between Roller Link Plate (Wrl)	38.1	Pv		
Thickness of Roller Link Plate (Trl)	8.89	Pv		
Height of Roller Link Plate (Hrl)	52.96	Pv		
Width between Pin Link Plate (Wpl)	55.88	Pv		
Thickness of Pin Link Plate (Tpl)	8.89	Pv		
Height of Pin Link Plate (Hpl)	52.96	Pv		
Pin Diameter (Dp)	22.89	Pv	Pin Length (Lp)	82.6
<input checked="" type="checkbox"/> Use User-defined Bushing Position				
Left Bushing Position		-31.75, 0.		
Right Bushing Position		31.75, 0.		
Bushing Width		55.88		
Dimension Information		Calculator		

V9R3



5. RecurDyn/Chain – Use Total Mass

Total Mass option allows a chain's entire mass to be distributed evenly to each Guide that makes up the Group Guide

Properties of GroupGuideArc1 [Current Unit : N/kg/mm/s/deg]

General Contact Characteristic Group Guide Arc

Geometry Data

Passing Points

No	X	Y	Z	R	Segments
1	-500.	0.	0.	Pt 721.110...	10
2	-200.	200.	0.	Pt 1000.	10
3	300.	200.	0.	Pt 721.110...	10
4	500.	-100.	0.	Pt 447.213...	10
5	400.	-300.	0.	Pt 1019.80...	10

View Reference Frame Ground.InertiaMarker M Automatic

Depth 200. Pv Thickness 10. Pv

Depth Normal Vector 0, 0, 1. Pt

Characteristic Use Only Link Roller Contact

Use Total Mass 37.321171037071 Pv

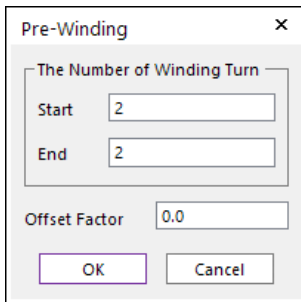
Each Rendering Automatic

OK Cancel Apply

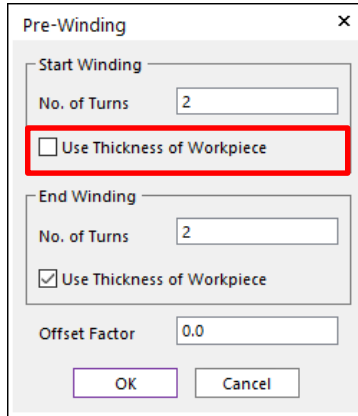
6. RecurDyn/R2R – Assembly without self-contact

1. User can ignore the self-contact → reduce the simulation time

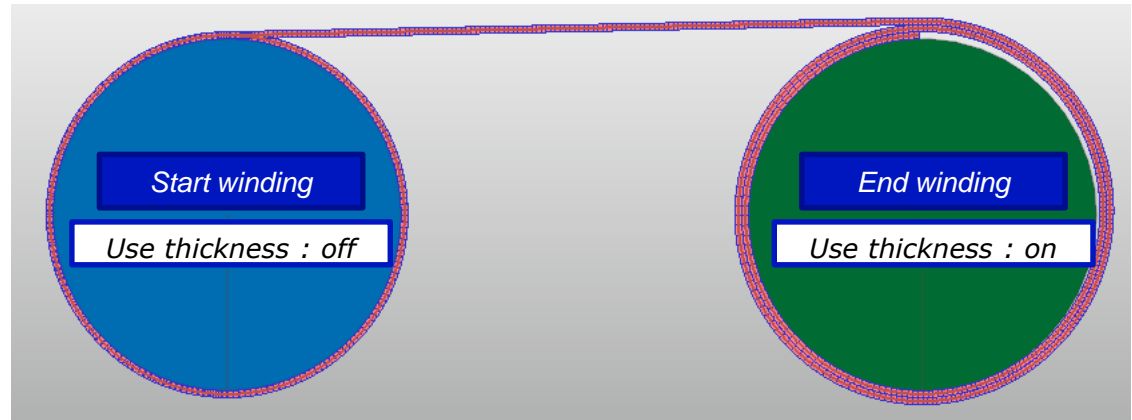
1) Check off 'Use Thickness of Workpiece



V9R2



V9R3





Others

Other enhancements

1. ProcessNet

- 1) Frequency Response Analysis
- 2) Geometry Export

2. New Tutorials

- 1) Acoustics tutorial
- 2) Particleworks interface tutorial (water sloshing)

Please refer to the release note for the other changes.



Thank you

Connect to All

Multidisciplinary integrated analysis solution implemented in one environment



RECURDYN

Particleworks

CFD

DEM

MBD

Control

FEA

MFBD

MBS-FE Coupling

CoLink

Simulink

FMI

SimulationX

AMESim

Simplorer

Self-contained solution for multidisciplinary integration including MFBD, CoLink and AutoDesign

Scalability through connection with analysis solutions

FEA – MFBD, G-Modeling, Durability, MBD for ANSYS

CFD - Particleworks (fluid particles) EHD (lubrication)

Control – CoLink, Simulink, FMI, AMESim, SimulationX, Simplorer

DEM - EDEM (solid particles)

Optimization – AutoDesign, Mode Frontier

Customization – Excel, C#

Others – KISSsoft (Gear/Bearing), TSG toolkit (experimental data)