RECURDYN
Toolkits

Various toolkits in RecurDyn support complex subsystems, including: media transport products such as printers and copiers, track assemblies on products such as construction machinery, military vehicles and recreational vehicles and machinery components such as gears, belts, and chains. The toolkits allow the user to perform modeling for a specific industry field quickly and easily and then conduct an accurate analysis of complicated mechanical systems with specialized solvers. This is a detailed introduction to the various toolkits of RecurDyn.

Machinery

- Gear
- Chain
- Belt

RecurDyn/Gear

RecurDyn/Gear provides the easier modeling and the analysis of complicated gear train system in the graphical user interface. RecurDyn/Gear can analyze vibration characteristics and DTE (Dynamic Transmission Error) which is occurred from the real contact characteristic among gear teeth, considering user-defined backlash and tolerance. Also, the post-process function provides to check the information about the contact normal forces and friction forces in the contact point at each time step.

◢ **Features:**

- Graphical user interface for easy and fast model generation
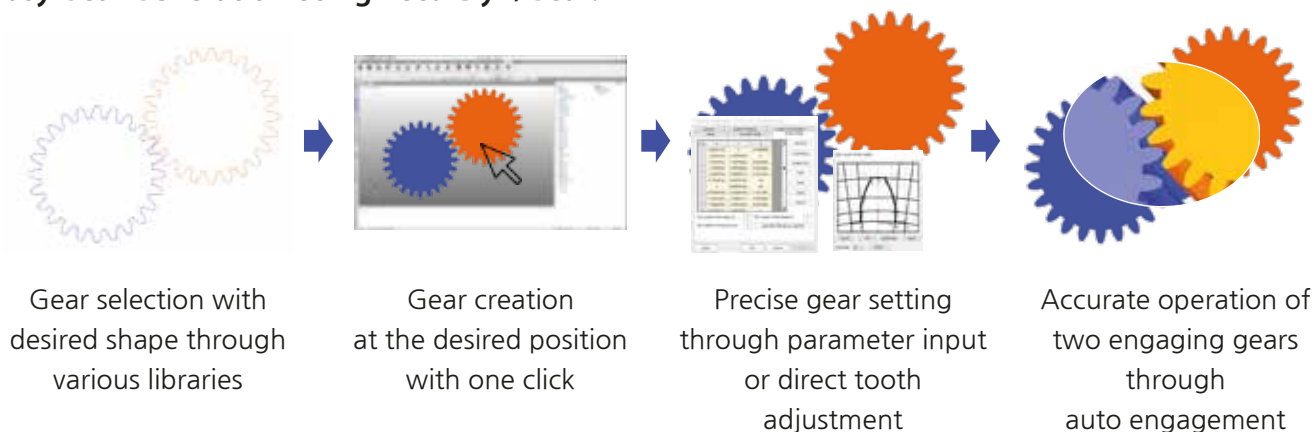- Library of custom geometric entities:
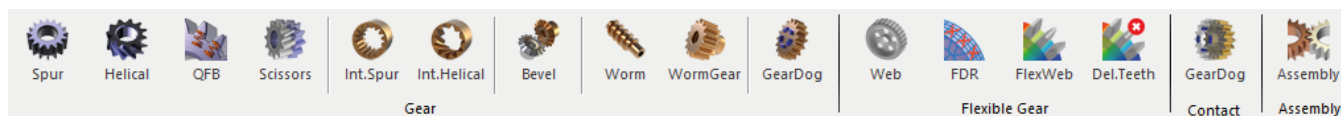
- Automatic gear geometry creation with automatic contact
- Efficient contact algorithms:
  - 2D Contact, 3D Contact, Involute Analytic Contact, Gear Dog Contact
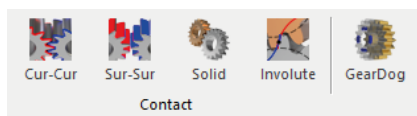
- Fast and robust solver
- Plotting of contact forces
- Gears defined using ISO standard parameters such as module, pressure angle, number of teeth, etc.
- Subsystem concept for efficient interaction with other model assemblies, such as in a complete engine model

◢ **Easy Gear Generation Using RecurDyn/Gear:**

| Gear selection with desired shape through various libraries | Gear creation at the desired position with one click | Precise gear setting through parameter input or direct tooth adjustment | Accurate operation of two engaging gears through auto engagement |

◢ **Benefits:**

- Model and simulate sophisticated models with gear trains quickly
- Obtain dynamic load history for stress and fatigue analysis
- Perform 'what if' studies in order to refine:
  - gear tooth profiles
  - gear stiffness
  - shaft stiffness
- Study product dynamics:
  - transient conditions at start-up
  - failure conditions at high speed
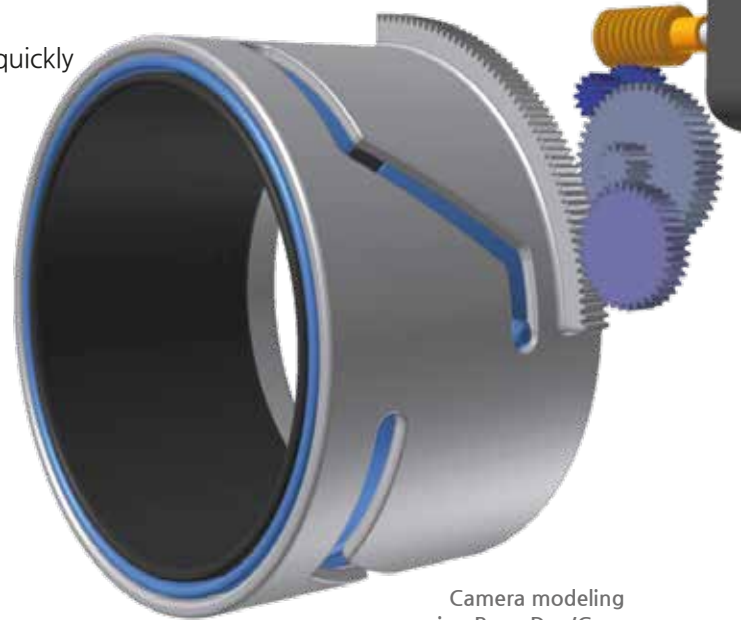
Camera modeling
using RecurDyn/Gear

◢ **Application Examples:**

- Motor driven machine such as transportation equipment or wind-turbine engine
- Driving part design of washing machine or dryer
- Analysis of vibration and noise in a gear box

Aircraft engine

Drive system of washing machine

Gearbox

Mechanical movement

Aircraft landing gear

Camera lens

Machinery
RecurDyn/Chain

RecurDyn/Chain automates the process of defining a chain system and supports standard chain entities such as sprockets, rollers (idlers), guide rails and lateral guards. Roller chain and silent chains can be modeled and analyzed in this toolkit.

◢ **Features:**

- Graphical user interface for easy and fast model generation
- Library of custom geometric entities:
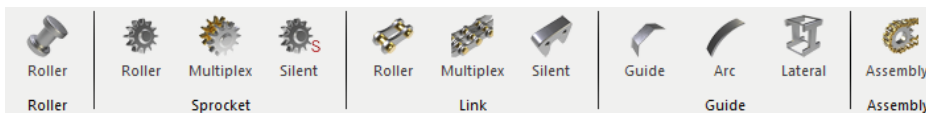
- Graphical or spreadsheet design of sprocket teeth profile
- Automatic chain assembly with automatic contact
- Efficient contact algorithms
- Fast & robust solver
- Plotting of contact forces and chain tension
- Subsystem concept for efficient interaction with other model assemblies, such as in a complete engine model
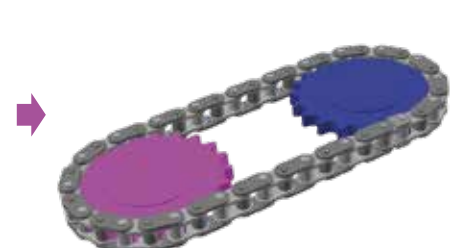
◢ **Easy Chain Generation Using RecurDyn/Chain :**
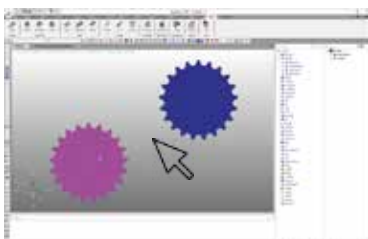
Easy creation of sprocket, link, roller and guide through intuitive UI and libraries

Precise geometry adjustment of sprocket and link

Automatic generation of chain assembly

◢ Benefits:

- Model & simulate sophisticated products quickly
- Obtain dynamic load history for stress & fatigue analysis
- Perform 'what if' studies in order to refine:
 - sprocket teeth profile design
 - chain link design
 - guide design
- Study product dynamics:
 - vibration excited by contact with discrete links
 - failure conditions at high speed
- Design tensioning devices to optimize chain tension
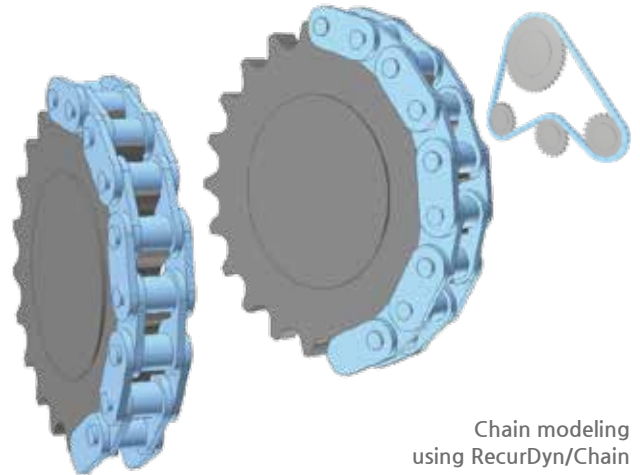
Chain modeling
using RecurDyn/Chain

◢ Application Examples:

- Evaluation of the system which includes chain
- Interference check between chains and parts during operation of automation equipment
- Lubrication characteristics of chain system (Particleworks interface is required)

Chainsaw

Bicycle chain


Lift driving part of forklift

RecurDyn/Belt

RecurDyn/Belt is used in a wide variety of fields from automotive timing and front-end accessory drives to lawn mowers, washing machines, and road milling equipment. Modeling belt and pulley systems with other CAE software requires significant time. RecurDyn/Belt makes it easier to model and simulate simple to complex three-dimensional belt drive systems.

◢ Features:

- Graphical user interface for easy and fast model generation
- Library of custom geometric entities:
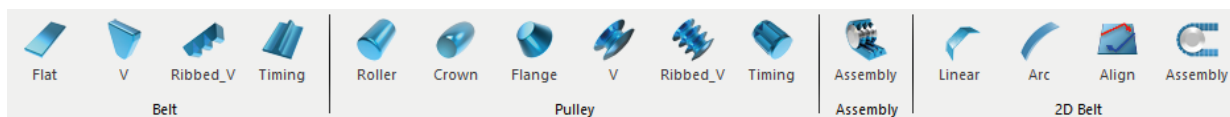
- ● ...eet design of pulley and belt cross sections
- ● Automatic belt assembly with contact
- Efficient contact algorithms
- Fast & robust solver
- Plotting of contact forces and belt tension
- Subsystem concept for efficient interaction with other model assemblies, such as in a complete engine model
- 2D belt and 2D guide to improve the simulation speed
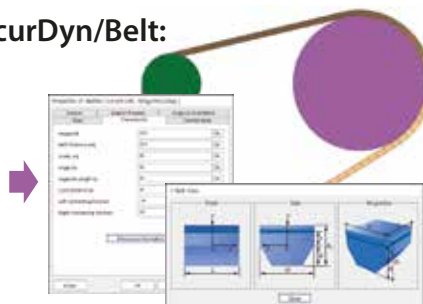- Flexible belt (Beam and Shell) to calculate the deformation of the belt
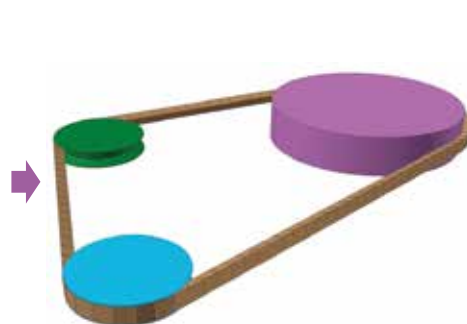
Timing Pulley   Timing Belt

◢ Easy Belt Generation Using RecurDyn/Belt:

Easy creation of belt, pulley, and guide through intuitive UI

Precise geometry adjustment of belt and pulley

Automatic generation of belt assembly

◢ **Benefits:**

- Model & simulate sophisticated products quickly
- Obtain dynamic load history for stress & fatigue analysis
- Perform 'what if' studies in order to refine:
  - pulley profile design
  - belt design
  - guide design
- Study product dynamics:
  - transient conditions at start-up
  - failure conditions at high speed
- Design tensioning devices to optimize belt tension
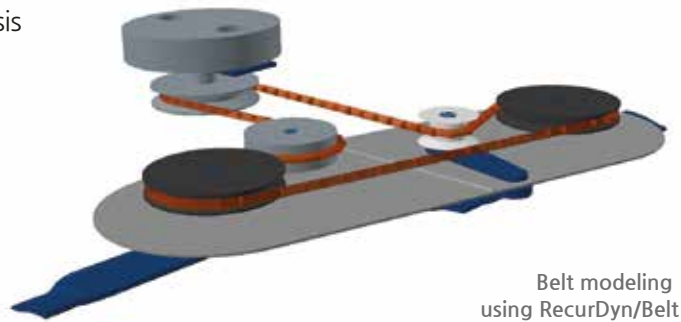
Belt modeling
using RecurDyn/Belt

◢ **Application Examples:**

- Timing belt of car
- Automatic bill counter
- Lawn mower
- Analysis of elevator rope
- Driving part analysis of automatic switchgear
- Belt drive system of washing machine
- Timing belt tension control of semiconductor manufacturing equipment
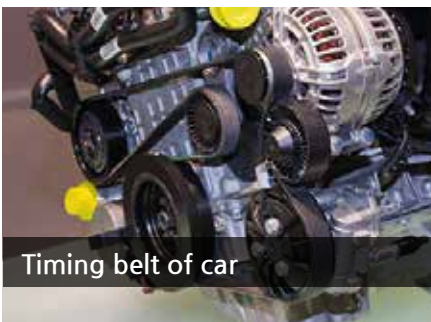
Timing belt of car

Belt drive system of washing machine

Elevator rope

Driving part of automatic switchgear

Automatic bill counter

Media Transport

- MTT2D
- MTT3D
- R2R2D

Media Transport

RecurDyn/MTT2D

RecurDyn/MTT2D (Media Transport Toolkit 2D) helps you efficiently create and simulate a sophisticated model of flexible media being transported by a mechanical system in a 2D environment. The analysis speed is very fast when using 2D analysis, and it is effective enough for models whose 3D behavior is not considered important. This toolkit can be used for analysis of copiers, printers, ATMs, etc. that handle media such as paper and film. It is widely used by many global companies related to printing equipments.

◢ Features:

- Automated modeling functions for Sheet, Roller and Guide
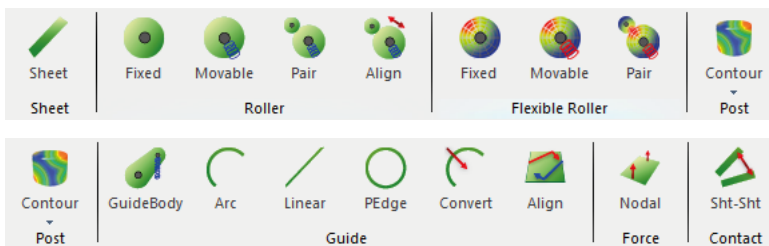
- Fast and accurate solver specialized for 2D media transportation system
- Modeling of the folding sheet with initial curl:
  - Sheet generation from a curve geometry
- Automatic contact definition among Sheet, Roller and Guide
- Friction characteristics
- Various sensors (Distance, Speed, Event (On/Off))
- Air resistance force and static electricity can be modeled using Nodal force
- Automatic generation of the guides from CAD geometry (STEP, IGES)
- Special parametric values provide access to important design parameters
- Automatic generation of relevant outputs for a sheet feeding system
- Guide Velocity and Soft-Nip model

◢ Easy MTT2D Generation Using RecurDyn/MTT2D:
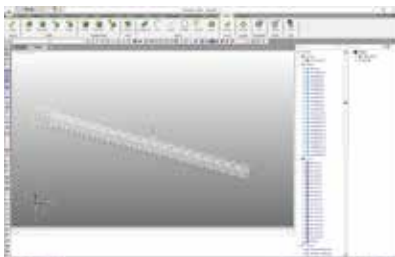
Sheet creation and property setting for flat or folded shape through intuitive UI
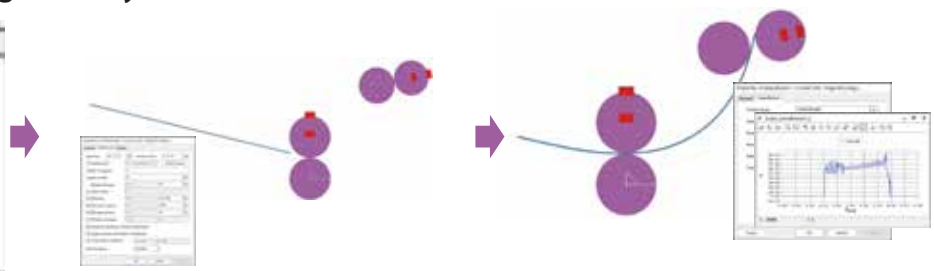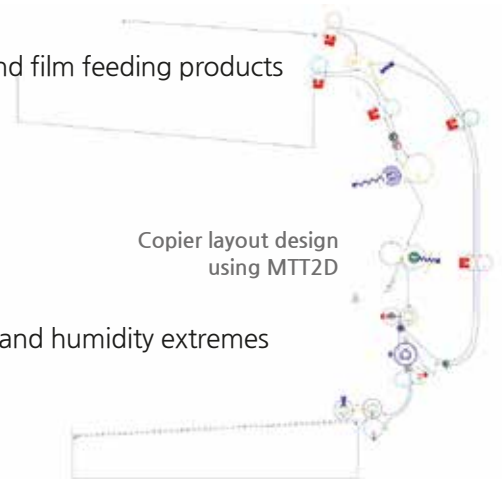
Easy creation of roller and guide according to sheet moving path

Possible to set various sensors at desired position

◢ Benefits:

- Simulate the 2D movement of a sheet through a media path easily.
- Applications include devices such as a printer, copier, fax, or other sheet and film feeding products
- Analyze the behavior of the flexible media with the large deformation
- Analyze the cause of the malfunctions such as jamming
- Use various sets of the basic properties of the media
  - Basis weight (or mass), size, bending property, etc.
- Predict the dynamic torque applied to the system
- Evaluation of the different characteristics of the sheet due to temperature and humidity extremes
  - Frictional properties (Sheet-Sheet, Sheet-Roller, Sheet-Guide)
  - Electrical properties (Nodal force can be used)
- Various operating conditions of the complex system can be evaluated
  - Different rotating speeds of the driving rollers and the driven rollers
  - Roller control with timing diagram (On/Off, acceleration/deceleration)

Copier layout design
using MTT2D

◢ Application Examples:

- Office equipment such as a printer, copier and fax machine
- ATM, Bill counter

Printer

Fax


Copier

ATM

Large-sized plotter

RecurDyn/MTT3D

RecurDyn/MTT3D (Media Transport Toolkit 3D) helps you efficiently create and simulate a sophisticated model of flexible media being transported by a mechanical system in a 3D environment. This toolkit can be effectively used for models whose 3D behavior is considered important and for analysis of flexible bodies.

◢ Features:

- Automated modeling functions for Sheet, Roller and Guide:
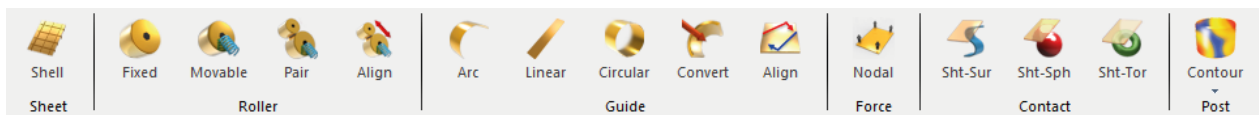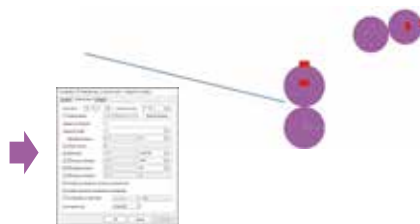

- Fast and accurate solver specialized for 3D media transportation system
- Shell element Sheet specialized for MTT3D
- Material characteristics for the flexible sheet (isotropic and orthotropic)
- Modeling of the folding sheet with initial curl
- Automatic contact definition among Sheet, Roller and Guide
- Friction characteristics
- Guide creation from 3D CAD geometry
- Various sensors (Distance, Speed, Event (On/Off), Tension)
- Air resistance force and static electricity can be modeled using Nodal force
- Special parametric values provide access to important design parameters
- Contour plot for the displacement, stress, strain of the sheet (can be exported)
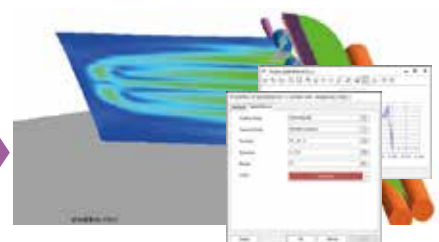- Automatic generation of relevant outputs for a sheet feeding system

◢ Easy MTT3D Generation Using RecurDyn/MTT3D:
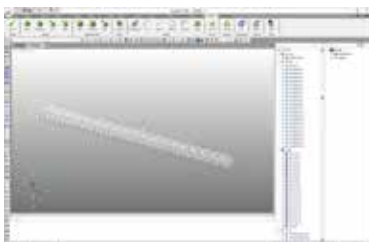
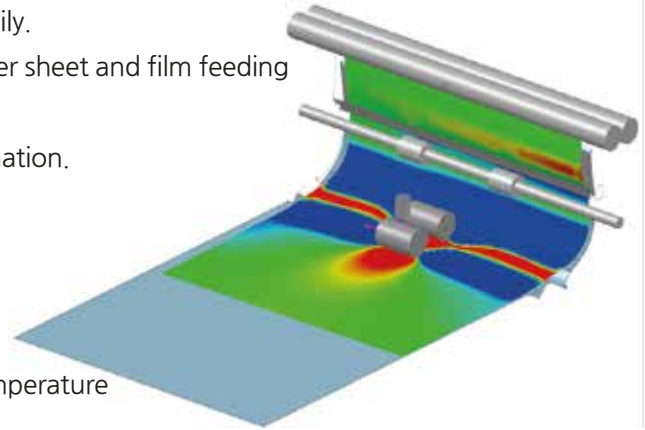| Sheet creation and property setting for flat or folded shape through intuitive UI | Easy creation of roller and guide according to sheet moving path | Possible to set various sensors at desired position |

◢ Benefits:

- Simulate the 3D movement of a sheet through a media path easily.
- Applications include devices such as a printer, copier, fax, or other sheet and film feeding products.
- Analyze the behavior of the flexible media with the large deformation.
- Analyze the cause of the malfunctions such as jamming
- Use various sets of the basic properties of the media
  - Basis weight (or mass), size, bending property, etc.
- Predict the dynamic torque applied to the system
- Evaluation of the different characteristics of the sheet due to temperature and humidity extremes
- Frictional properties (Sheet-Sheet, Sheet-Roller, Sheet-Guide)
- Electrical properties (Nodal force can be used)
- Various operating conditions of the complex system can be evaluated
  - Different rotating speeds of the driving rollers and the driven rollers
  - Roller control with timing diagram (On/Off, acceleration/deceleration)

3D behavior analysis of paper using MTT3D

◢ Application Examples:

- Office equipment such as a printer, copier and fax machine
- ATM, Bill counter
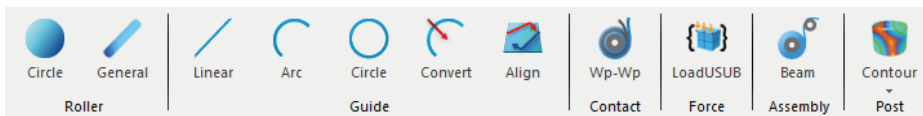

Printer

Fax

Copier

ATM

Large-sized plotter

Media Transport
RecurDyn/R2R2D

RecurDyn/R2R2D (Roll-to-Roll 2D) helps you efficiently create and simulate a Roll-to-Roll system in a 2D environment. The analysis speed is very fast when using 2D analysis, and it is effective enough for models whose 3D behavior is not considered important. This toolkit can be used for analysis requiring the transfer and winding process of wire, thin plate, film, paper and textiles. It is widely used in the fields of printing equipments, batteries, and displays.

◢ **Features:**

- Automated modeling functions for Roller, Guide and Workpiece (wire/thin plate)

Circle	General	Linear	Arc	Circle	Convert	Align	Wp-Wp	LoadUSUB	Beam	Contour
Roller				Guide			Contact	Force	Assembly	Post

- Fast and accurate solver specialized for 2D Roll-to-Roll system (winding and unwinding)
- Modeling of the Workpiece as a flexible body using MFBD (Beam element)
- Modeling of the Workpiece wound across multiple rollers
- Pre-winding function to model the Workpiece wound around a roller multiple times
- Various rollers including Circle Roller
- Automatic contact definition between Workpiece and Roller
- Friction characteristics
- Various sensors (Speed, Distance, Slip, Tension)
- Mathematical air resistance model
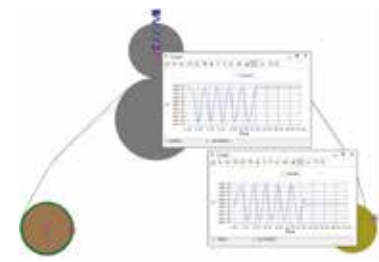- Various results of the Workpiece can be reviewed (Stress, Strain, etc)

◢ **Easy Track Generation Using RecurDyn/R2R2D:**
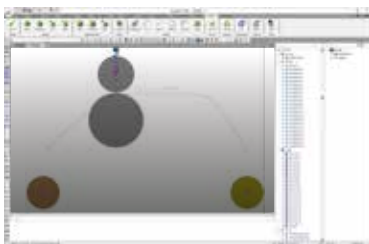
Easy creation of Roller and Guide through intuitive UI

Create Workpiece according to sheet moving path and set winding, unwinding and pre-winding

Analysis results of Roll-to-Roll model through animation and graph

◢ Benefits:

- Design and analyze the production and printing equipment that transports various types of thin and flexible materials through rollers or wraps them around rollers
- Design and analyze the tension control device required in the transfer and winding process of thin plate, film, paper, textile, etc.
- Analyze the behavior of the flexible Workpiece with large deformation
- Consider the changes in weight and rotational inertia that occur during winding and unwinding
- Predict the stress imbalance that occurs when material is stacked due to winding (defect prediction)
- Predict the dynamic torque applied to the system
- Various operating conditions of the complex system can be evaluated
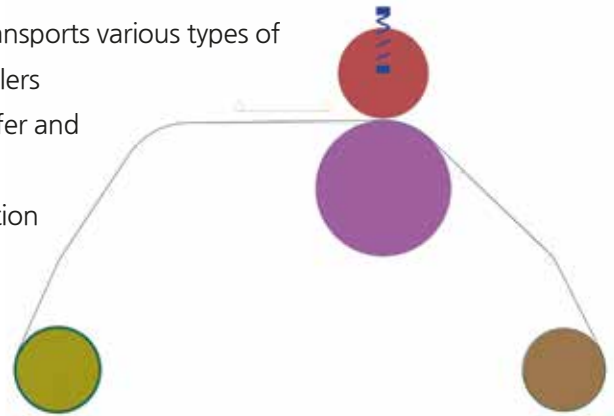
Roll-to-Roll system layout design using R2R2D

◢ Application Examples:

- Roller transfer system of battery plate
- Roller transfer system of thin film for display
- Large-sized plotter
- Roller transfer system of textile

Steel sheet

Textile looms

Coil cutting

Large-sized plotter

Lithium-ion battery
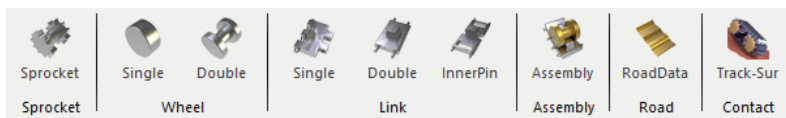
Track

- **TrackHM**
- **TrackLM**

Track
RecurDyn/TrackHM

RecurDyn/TrackHM (High Mobility Track Toolkit) gives the ability to simulate military-style tracked vehicles, where the track shoes are typically defined as a combination of a steel frame and track pads. Band track with similar characteristics can also be modeled. The toolkit supports the definitions of sprockets, roadwheels, idlers and the initial track shoe which is replicated along a user-defined path.

◢ **Features:**

- Graphical user interface for easy and fast model generation
- Fast and accurate solver specialized for Track model
- Library of custom 3D geometric entities:

| Sprocket	Single	Double	Single	Double	InnerPin	Assembly	RoadData	Track-Sur
Sprocket	Wheel		Link			Assembly	Road	Contact

- Graphical design of sprocket teeth profile (lines and arcs) and shoe pad profile
- Automated track assembly
- Efficient contact algorithms yield fast, robust simulations
- Easy creation of terrains, with a library of standard proving grounds
- Subsystem capability allows each track assembly to be created and simulated separately, then integrated into the vehicle model
- Integrated Bekker's Soil Model with additional soil definition options using parameters and/or a user-defined function
- Plotting of specific results such as track link contact forces and track tension
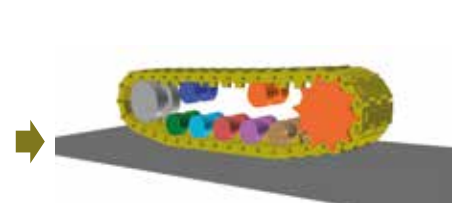
◢ **Easy Track Generation Using RecurDyn/TrackHM:**

Easy creation of sprocket, wheel, and link through intuitive UI
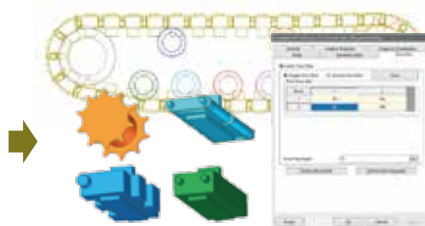
Precise geometry adjustment for sprocket, track link, and wheel

Automatic generation of track assembly

◢ Benefits:

- Calculate dynamic load history for stress and fatigue analysis
- Study dynamic performance of vehicle:
  - Evaluation of the ride quality, the crew comfort, and the safety
  - Observe vibration due to discrete track links
  - See separation of track link from sprocket and idler
  - Use library with various terrains
    (bump, trench, ditch, cross country)
- Component optimization:
  - Sprocket teeth profile design
  - Shoe pad shape design
- Optimize suspension spring rates, damping and controller
  (whether passive, semi-active, or active)
- Optimize track tensioner to stabilize tension
- Assess performance of turret and weapon controllers during maneuvers
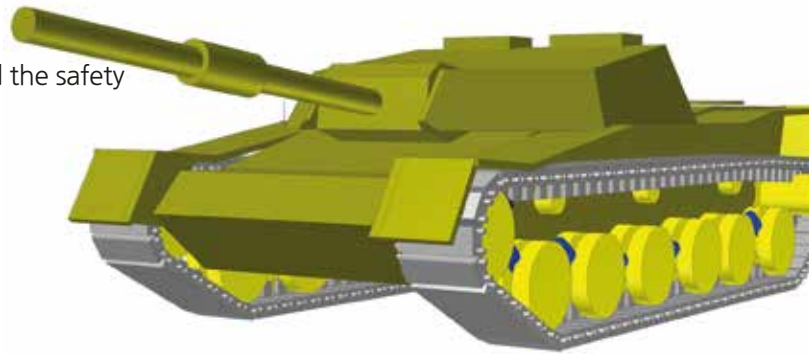
Tank modeling
using RecurDyn/TrackHM

◢ Application Examples:

- Military vehicles such as armored vehicles, tanks, and personnel carriers
- Recreational vehicles equipped with caterpillar such as snowmobiles

Tank

Stair Climbing Robot

https://dod.defense.gov/


Military Experimental Robot

https://www.dvidshub.net/

RecurDyn/TrackLM

RecurDyn/TrackLM (Low Mobility Track Toolkit) gives the ability to simulate construction-style tracked vehicles. The toolkit supports the easy creation of sprockets, rollers, idlers and link. Also, graphical design of sprocket teeth profile and grouser of the track link is supported.
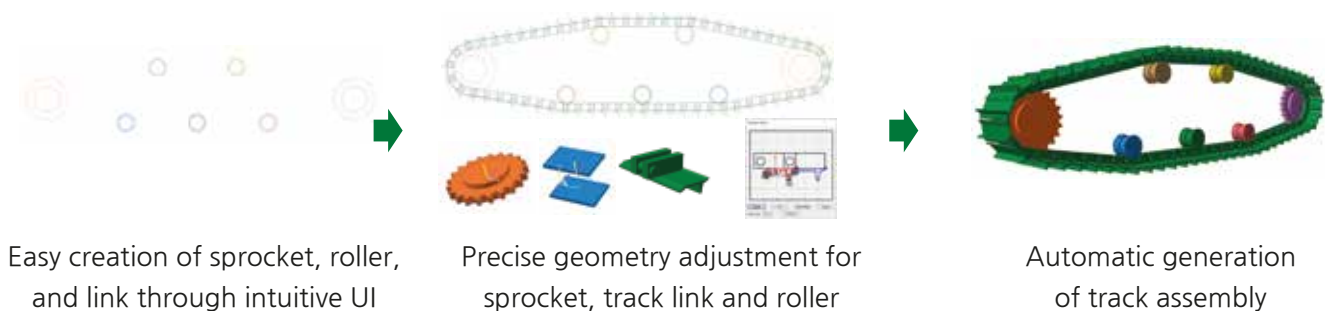
◢ Features:

- Graphical user interface for easy and fast model generation
- Fast and accurate solver specialized for Track model
- Library of custom 3D geometric entities:
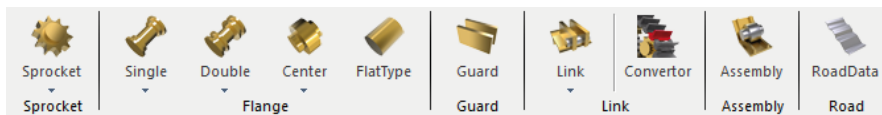
- Graphical design of sprocket teeth profile (lines and arcs) and link grouser profile (line segments)
- Automated track assembly
- Efficient contact algorithms yield fast, robust simulations
- Easy creation of terrains, with a library of standard proving grounds
- Subsystem capability allows each track assembly to be created and simulated separately, then integrated into the vehicle model
- Integrated Bekker's Soil Model with additional soil definition options using parameters and/or a user-defined function
- Plotting of specific results such as track link contact forces and track tension

◢ Easy Track Generation Using RecurDyn/TrackLM:

Easy creation of sprocket, roller, and link through intuitive UI

Precise geometry adjustment for sprocket, track link and roller

Automatic generation of track assembly

◢ Benefits:

- Calculate dynamic load history for stress and fatigue analysis
- Study dynamic performance of vehicle
  - Evaluation of the ride quality, the crew comfort, and the safety
  - Observe vibration due to discrete track links
  - See separation of track link from sprocket and idler
  - Use library with various terrains (bump, trench, ditch, cross country)
- Component optimization
  - Sprocket teeth profile design
  - Grouser shape design
- Optimize suspension spring rates, damping and controller
  (whether passive, semi-active, or active)
- Optimize track tensioner to stabilize tension

Excavator modeling
using RecurDyn/TrackLM

◢ Application Examples:

- Construction equipment
- Heavy equipment

Bulldozer

Excavator

Tractor

System Requirements

- Supported Operation Systems
  - Windows 7, 8.1, 10
  - Windows server 2008, 2012
  - Red Hat Enterprise Linux Server (4.8, 5.8, 6.3, 7.3)
  - Red Hat Enterprise Linux Client (7.3)
  - SUSE Linux Enterprise Server (10 SP1, 11 SP2, 12 SP3)
- CPU 2.4GHz (Recommended : 3.4GHz, Quad Core or better)
- RAM 8GB (Recommended : 32GB or more)
- HDD 10GB (Recommended : 1TB)

* RecurDyn is a trademark of FunctionBay, Inc. All other trademarks or registered trademarks belong to their respective holders.

* The included contents are available for RecurDyn V9R2 or later version. In addition, contents may be added or deleted in future versions.

* RecurDyn supports only 64-bit OS.

Contact

Korean Headquarters R&D Center

FunctionBay, Inc.
5F, Pangyo Seven Venture Valley 1 danji 2 dong, 625, Sampyeong-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 13487, South Korea
82+31-622-3700   http://www.functionbay.com   info@functionbay.co.kr

Overseas Subsidiaries

FunctionBay K.K. JAPAN
2F, Onoyakyobashi Bldg., 1-4-10, Kyobashi, Chuo-ku, Tokyo, 104-0031 Japan
81-3-3243-2031   www.functionbay.co.jp   fbj_info@functionbay.co.jp

FunctionBay CHINA
350 Xianxia Rd., Kechuang Bldg. Suite #106 Shanghai 200336, China
86-21-5240-0270   www.recurdyn.cn   info@pro-lambda.com

TAIWAN AUTO-DESIGN CO. CADMEN CO.
11F., No.68, Sec. 2, Xianmin Blvd., Banqiao Dist., New Taipei City 220, Taiwan (R.O.C.)
886-2-2956-7575   www.cadmen.com.tw   johnson.liao@cadmen.com.tw

Function Dynamics (I) PVT. LTD.
301 Odeon Plaza II Sector 10, Dwaraka, New Delhi 110075 INDIA
91-11-28083519   bsridhar@functiondynamics.in

FunctionBay GmbH. GERMANY
Central Tower Landsbergerstr. 110 80339 Munich Germany
49-89-322-098-27   www.functionbay.de   Info@recurdyn.de

EnginSoft USA LLC
7210 Virginia #100-6243, McKinney, TX 75071 - USA
1-469-912-0504   www.enginsoftusa.com   info@enginsoft.com

FunctionBay Italy s.r.l. (Fabiano Maggio)
Via Giambellino, 7, 35129, Padova (PD), Italy
39-340-7640864   www.functionbay.it   info@functionbay.it

facebook.

Linked in

You Tube