

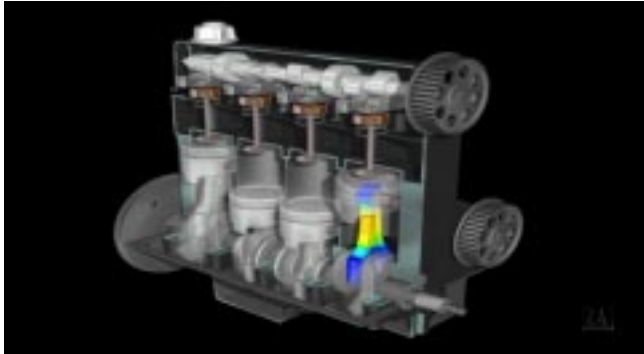
ADAMS/Engine:

A complete environment for the powertrain component analysis


ADAMS

ADAMS/Engine

a complete environment for the powertrain component analysis



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ADAMS

How can I...


- Select the right design concept?
- Develop the design that was selected?
- Make the decision before large investments are made?
- Share input data, results and products throughout the corporation

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Vision ADAMS/Engine

- Will support in solving structural load, life, durability, vibration and performance problems within cost, weight, package constraints.
- Will aid in the selection of fundamental designs prior to physical prototypes.
- Will be able to refine existing designs and quickly solve production problems.
- Will provide common methods throughout corporations and suppliers for modeling and design practices.


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Value to the customer

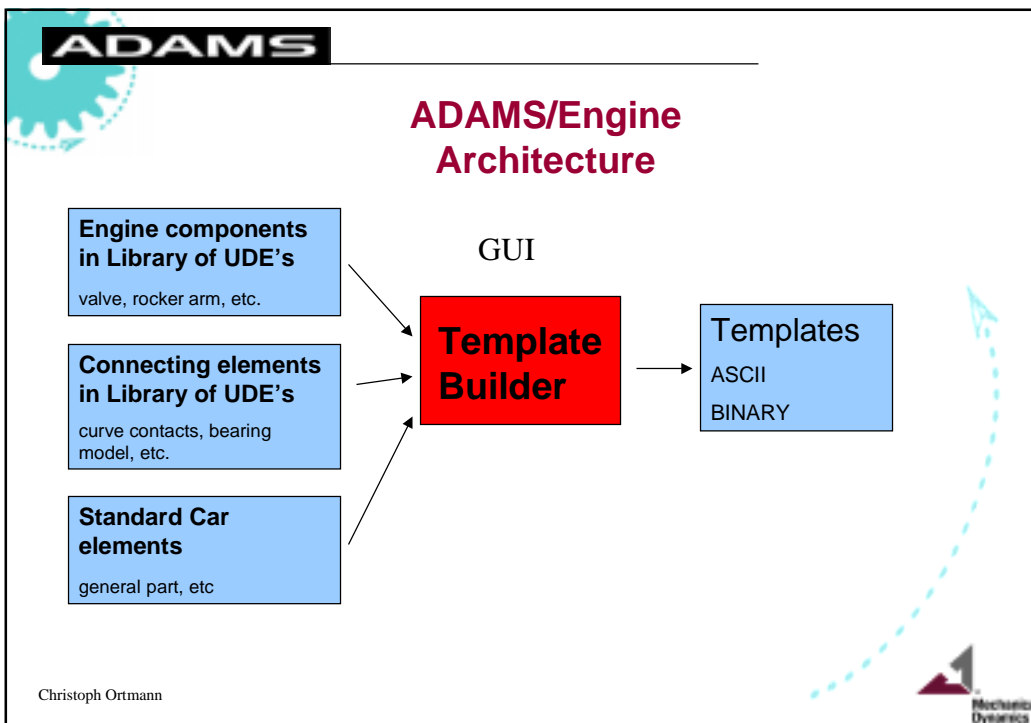
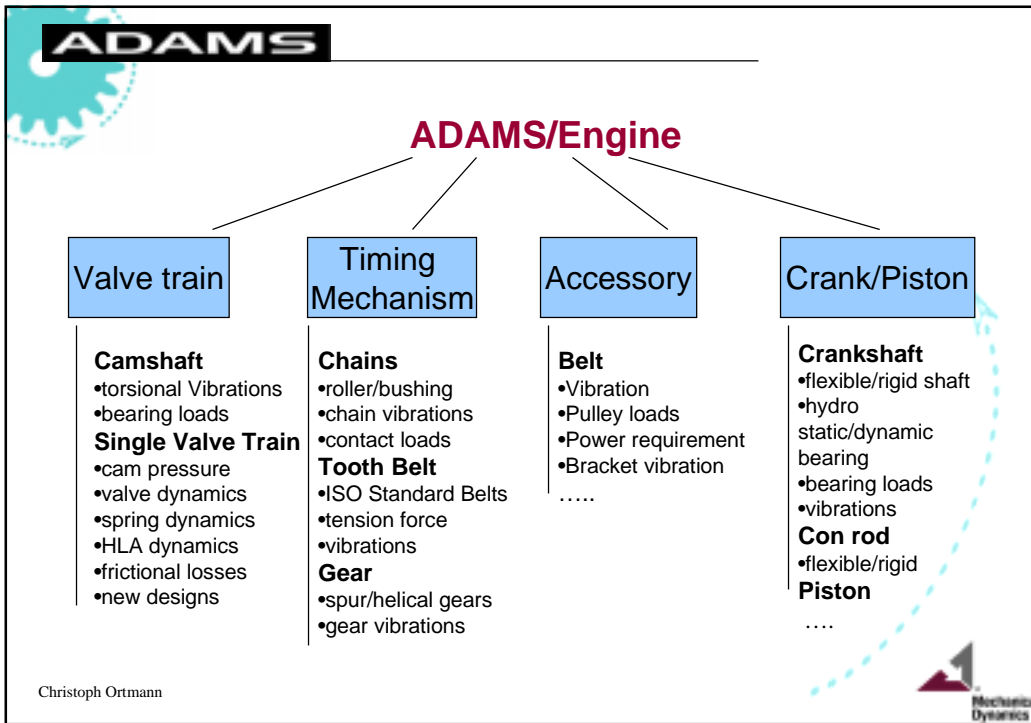
- Engineering decisions are made on time.
- Fewer/no structural problems occur late in the development process or after production.
- Lower test cost, fewer reversals of engineering decisions, resulting in high engineering cost and long time for design prove out.
- More reliable powertrains with less warranty cost and better customer satisfaction.
- Corporate methods are part of the analysis tool to assure that new engineers use the best modeling methodology and data analysis process

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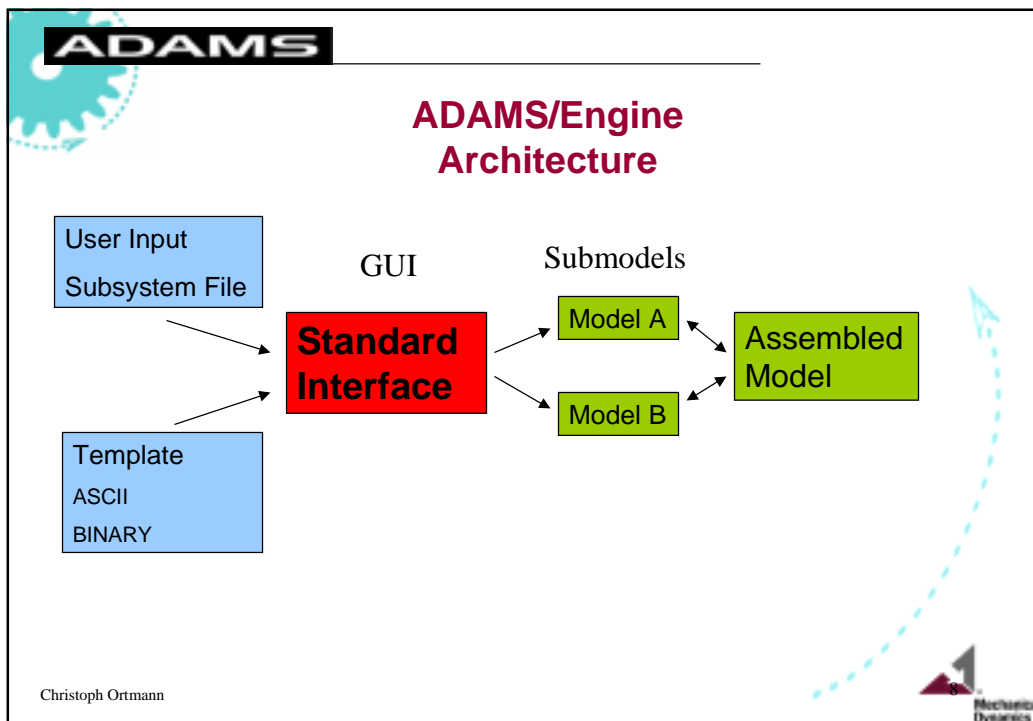
Modeling Elements in Template Builder

- ◆ Cam
- ◆ Tappets
 - ◆ rigid
 - ◆ spring damper
 - ◆ hydraulic
- ◆ Valve
 - ◆ rigid
 - ◆ axial flexible
- ◆ Valve Spring
 - ◆ linear spring damper
 - ◆ nonlinear spring damper
 - ◆ multi mass spring
- ◆ Rocker Arms
- ◆ Roller
- ◆ Plate
- ◆ Contacts



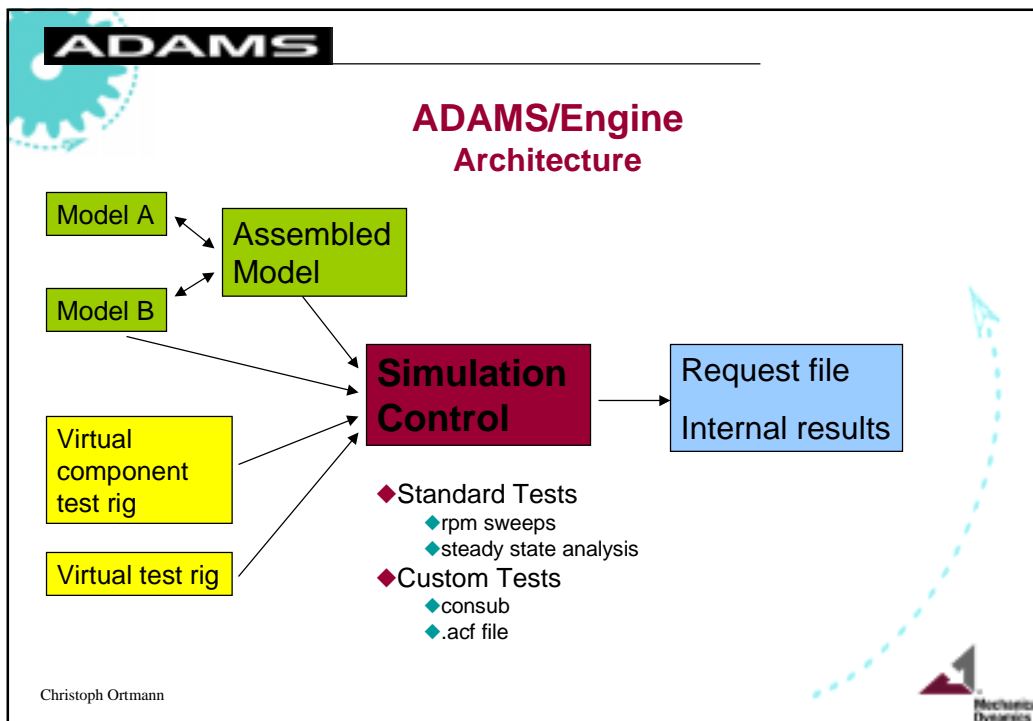
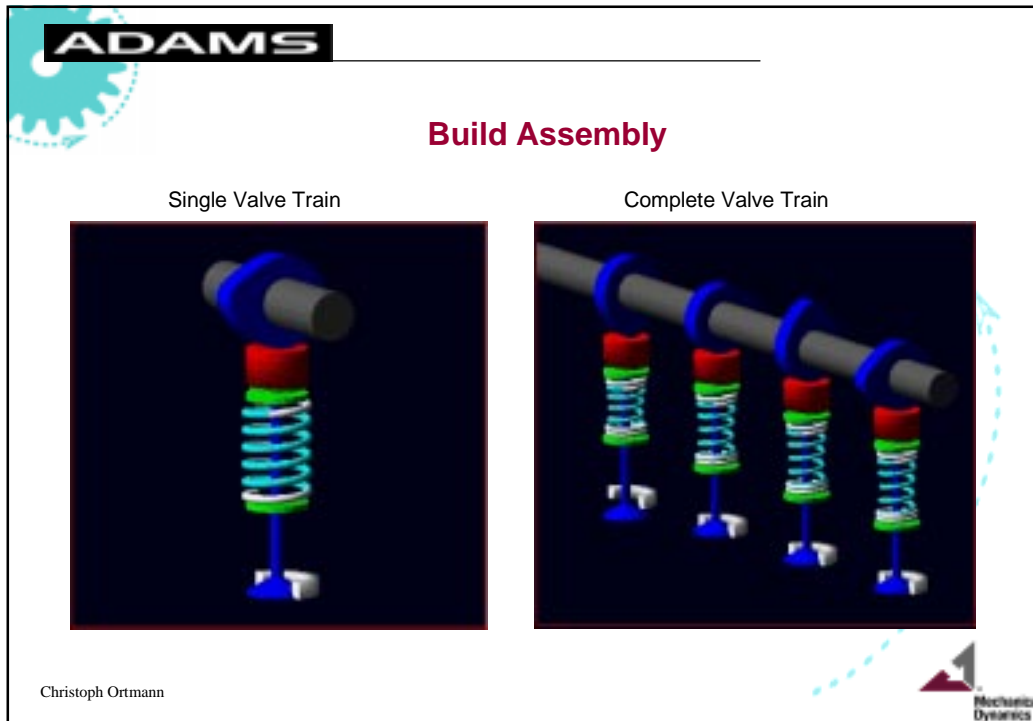
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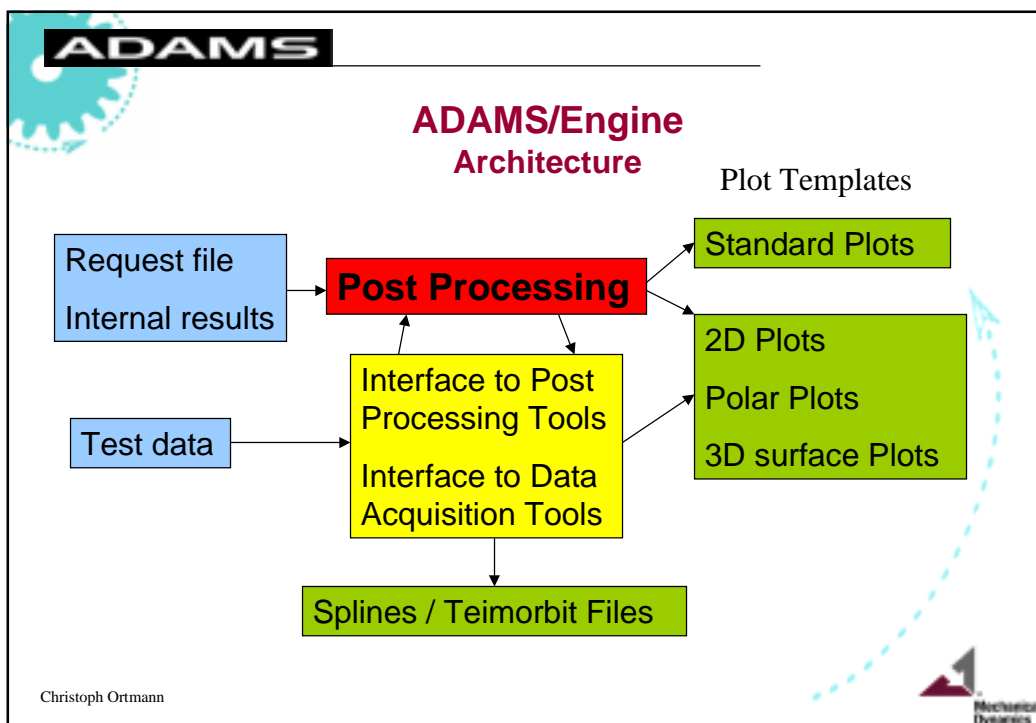
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Standard Tests

Rpm Sweep (1000 -6000 camshaft rpm) Constant rpm (6000 camshaft rpm)

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Standard Plots

Multi Axis Plotting

Cross Plotting

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Postprocessing of transient response

Additional result file for plotting with external tools

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How does ADAMS/Engine relate to ADAMS/CAR?

- ◆ share architectural paradigm
 - ◆ template
 - ◆ subsystem
- ◆ share functionality
 - ◆ general part
 - ◆ hardpoint table
- ◆ share utilities
 - ◆ car database
 - ◆ toolkits

ADAMS/Engine is build on/with ADAMS/Car

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ADAMS/Engine Competitive Advantage


Complete Solution

- ◆ Component level
- ◆ Subsystem level
- ◆ System level

3D modeling


- ◆ bearing loads in 3D
- ◆ new valve train designs
- ◆ detailed gear model
- ◆ detailed chain/ belt model
- ◆ flex bodies

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ADAMS/Engine:



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ADAMS/Engine Competitive Advantage

- Database
 - ◆ proven and commonly used database (ACAR)
- Virtual modeling environment
 - ◆ hierarchical modeling structure
 - ◆ interactive modeling in template builder mode
 - ◆ interactive modeling in standard user mode
- File based modeling environment
 - ◆ modeling through subsystem files and property files
- Customizable
 - ◆ easy customization through open architecture
 - ◆ easy customization through dialog box builder

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Valve Train Application

Modeling Elements:

- ◆ Cam
- ◆ Roller
- ◆ Tappet
- ◆ Push Rod (rigid/flexible)
- ◆ Rocker Arm
- ◆ Bridge
- ◆ Spring
 - ◆ spring damper
 - ◆ nonlinear
 - ◆ linear
 - ◆ multi mass spring
 - ◆ surge
 - ◆ coil clash
- ◆ Valve
- ◆ Valve Seat
- ◆ Contacts (force based)

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Valve Train Applications

- Curve Contacts
 - ◆ lift off
 - ◆ friction
 - ◆ hertzian pressure
- General Contacts
 - ◆ friction
 - ◆ nonlinear stiffness



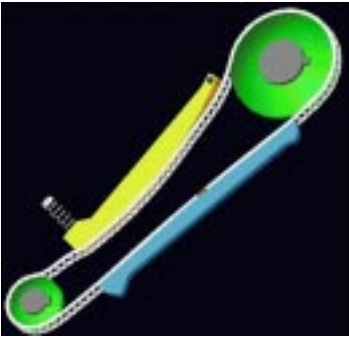
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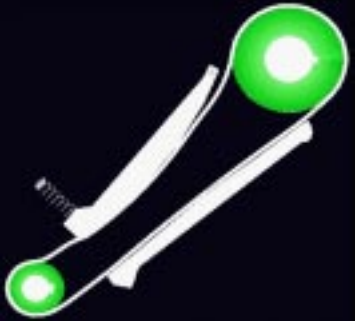
Chain Drive Application

- ◆ Wear
- ◆ Noise



2400 rpm

- ◆ Transversal Oscillations
- ◆ Longitudinal Oscillations



8000 rpm

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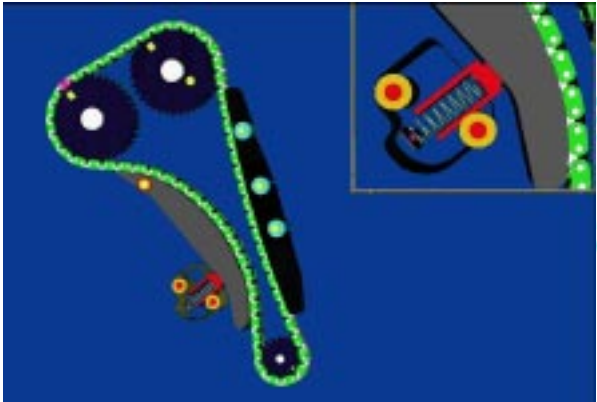
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Chain Drive Application

- ◆ Contact Forces
- ◆ Link Tension Force
- ◆ Tensioner
 - ◆ hydraulic pressure
 - ◆ valve dynamics
 - ◆ force



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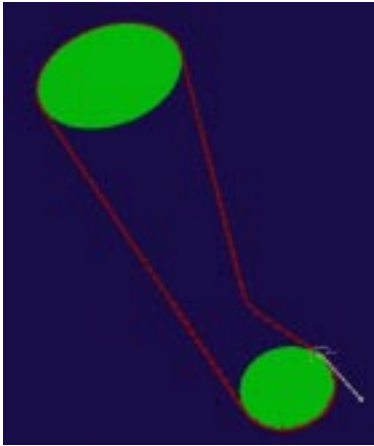
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The image shows a 3D CAD model of a chain drive system. The main view displays a chain loop with a tensioner mechanism. An inset image provides a closer look at the tensioner, which includes a hydraulic cylinder and a valve. The model is rendered in a dark blue environment with green highlights on the chain links and tensioner components.

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Tooth Belt Application

- ◆ Tension Force
- ◆ Tooth Contact Force
- ◆ Tensioner Performance
- ◆ Bearing Loads
- ◆ Nonlinear Stiffness
- ◆ Oscillations



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The image shows a 3D CAD model of a tooth belt drive system. The main view displays a tooth belt loop with two pulleys. The belt is rendered in a dark red color, and the pulleys are shown in green. The model is set against a dark blue background.


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Gear Application

- ◆ Involute profile
- ◆ Changing number of teeth in contact
- ◆ changing amount of backlash due to changes of the gear center distance

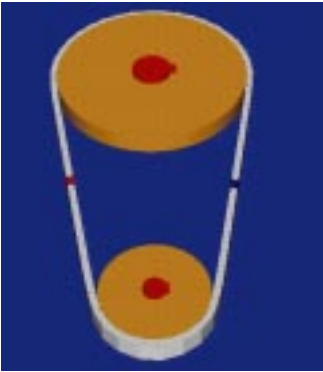


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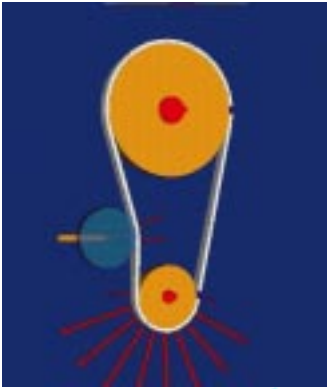
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Belt Applications



- ◆ Tensioner Performance
- ◆ Bearing Load



- ◆ Tension Force
- ◆ Stiction & dyn. Friction
- ◆ Oscillations

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The screenshot displays the ADAMS software interface for a "Crank Piston Mechanism Application". At the top left is the ADAMS logo. The main title "Crank Piston Mechanism Application" is centered in red. Below the title, on the left, is a 3D CAD model of a crankshaft and piston assembly. The crankshaft is shown in yellow and green, and the piston is in pink. A coordinate system is visible with axes labeled X, Y, and Z. On the right, a graph titled "Equatorial Correlation" shows a red line plot of correlation values over a range of 0 to 180 degrees. The y-axis ranges from -0.05 to 0.05. The plot shows a complex, non-linear relationship. In the bottom left corner, the name "Christoph Ortmann" is displayed. In the bottom right corner, there is a logo for "Mechanical Dynamics" with a stylized gear icon.