

Kosme

Customer Profile: Stefano Grassi

Stefano Grassi is Technical Director and Member of the Board of Directors at Kosme. Kosme produces a full range of turnkey filling, labeling, capping, packaging and conveying solutions for beverage products including soft drinks, water, beer, wine, and spirits, as well as personal care products. Grassi oversees a team of engineers that consults with customers and develops innovative solutions for processing their products.



Challenge

In developing custom solutions for customers, Kosme is frequently asked to develop machines that will operate faster and more reliably than their predecessors. Increasing the speed of machines raises inertial loads, creating the potential for vibration and resonances that could substantially reduce the life of the machines and cause breakdowns. In the past, Kosme engineers used hand calculations to estimate the performance of components and built physical prototypes to evaluate system performance. Problems were frequently discovered during the prototype stage. These problems often required many iterations of revisiting the design and modifying and re-testing the prototype.

Solution

MSC Nastran finite element analysis software and MSC Adams multibody simulation software.

Benefit

Simulation makes it possible for Kosme to design, optimize and visualize packaging machines prior to the prototype stage. The result is that the company is able to engineer substantial performance improvements while getting the design right the first time.

Case Study

A customer in Argentina recently asked Kosme to build a bottle-boxing machine capable of processing 36,000 bottles per hour. This represented a substantial increase over the previous generation of machines which were only capable of processing 24,000 bottles per hour.

“The primary limiting factor on the performance of the machine is the ability to move bottles at high speeds without incurring vibration that will damage the machine in a relatively short period of time,” Grassi said. “To increase machine speed we need to increase the strength of critical mechanism components while keeping their weight low to reduce the strain on motors, drive systems and structural members.”

Kosme engineers began the design process by importing a CAD model of the previous design into ADAMS. They added higher-fidelity features such as contacts, bushings, motions, couplers and more complex joints. The previous machine generation was designed using ADAMS under the assumption that all machine components were composed of rigid bodies. To achieve the higher levels of performance required for the new machine, MSC/NASTRAN was used to produce finite element models of critical components such as the arms that carry the bottles. The finite element models were incorporated into the ADAMS model as super-elements using a modal neutral file that describes the geometry, nodal mass and inertia, and generalized mass and inertia for each mode shape.

The model behaved nearly the same as the previous generation machine, making it possible to begin evaluating alternative solutions for the new generation by modifying the model and measuring the impact on machine speed and vibration.

The finite element model revealed the stress in components under actual machine operating conditions. This made it possible to improve component design by reducing mass in low-stress areas and adding mass in high-stress areas. Using this process, the mass of critical moving components was reduced by 20% to 30% while reducing stress levels. The finite element model also identified resonant frequencies of the components and in several cases geometry changes were made to move these frequencies to avoid potential excitations.

“ The ability to quickly and thoroughly evaluate many design alternatives with MSC.Software’s solutions made it possible to increase the processing speed of our machines by 50%, while reducing vibration levels below the previous generation of machines. ”

The dynamic simulation in ADAMS was used to evaluate the performance of the complete machine at various speeds including potential vibrations. Each design iteration took between one and two days and didn’t require any hardware, which meant that the design process moved much more quickly than would have been possible using the old build-and-test approach. The simulations also provided much more information than could be gained from physical testing, such as displacement, acceleration, loads and torques of every node in the model throughout the time period of the simulation.

“Our ability to quickly and thoroughly evaluate many design alternatives made it possible to increase the processing speed of the machine by 50% while reducing vibration levels below the previous generation of machines,” Grassi said. “The first prototype provided the performance and functionality predicted by the simulation so it became the final product. The new machine was completely designed in one and a half months, faster than any similar machine. ”

MSC Products Used:

MSC Nastran

- Powerful Analysis Capabilities
 - Static Stress
 - Normal Modes
 - Linear Buckling
 - Dynamics
 - Static and Transient Heat Transfer
 - Dynamics
 - Frequency / Harmonic Response
 - Static and Transient Nonlinear
 - Rotor Dynamics
 - Interior Acoustics
- Full range of material models
 - Isotropic
 - Orthotropic
 - Anisotropic
 - Temperature-dependent
- Design Optimization
 - Shape
 - Size
 - Topology
- Adams Integration
- Superelements for increased collaboration and solution efficiency
- Efficient Solvers
 - Sparse matrix solvers
 - Iterative solvers
 - Parallel and vector processing

MSC Adams

Capabilities

- Creation or import of component geometry in wireframe or 3D solids
- Extensive library of joints and constraints to define part connectivity
- Internal and external forces definition on the assembly to define your product's operating environment
- Model refinement with part flexibility, automatic control systems, joint friction and slip, hydraulic and pneumatic actuators, and parametric design relationships
- Ability to iterate to optimal design through definition of objectives, constraints, and variables
- Automatic generation of linear models and complex loads for export to structural analyses
- Comprehensive linear/nonlinear results for testing complex, large-motion designs
- Superior contact capabilities supporting 3D contact between modal flexible bodies and solid geometry

High Performance Computing (HPC)

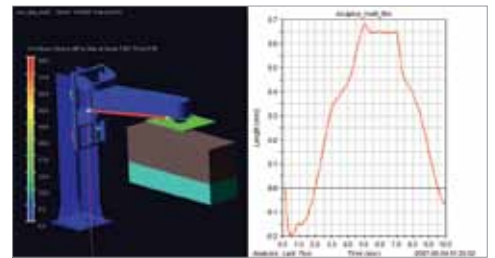
- 64-bit support on Windows and Linux platforms
- Parallel processing support for Adams/Tire results
- Shared Memory Parallel solver
- Obtain nonlinear results for testing complex, large-motion designs

Adams Package includes:

- Adams/Solver
- Adams/Linear
- Adams/View
- Adams/Flex
- Adams/Durability
- Adams/Vibration
- Adams/Controls
- Adams/Exchange
- Adams/Foundation
- Adams/Insight
- Postprocessor
- Shared Memory Parallel (SMP)
- Tire API

Optional Modules

- Adams/Tire FTire



High-speed infeed machine for bottles: ADAMS model



High-speed infeed machine for bottles: physical prototype

Company Profile

KOSME designs and manufactures a full range Packaging and Beverage lines, providing custom solutions based on the philosophy: high performance, highly reliable, simple to use. Kosme guarantees world coverage with direct sales and sales through agents. The worldwide, young, flexible, highly motivated organization will provide you with innovative solutions. The company employs technical specialists that consult with customers and develop specific solutions for any application. Kosme's Service and Spare Parts departments are rapid and efficient thanks to the highly skilled staff. Each year the number of employees and tools available to assist customers grows in proportion to the number of Kosme machines installed across the world. Kosme's network of associated companies and agents now covers the five continents and guarantees our high quality standard and rapid emergency service. Today, Kosme is a company that can provide you with competitive, reliable alternative solutions in the vast Packaging & Beverage industry.

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