

Ansys + Metso

“Our goal in designing the new C130 jaw crusher was to deliver greater work capacity without increasing the weight of the machine. We used Ansys SpaceClaim to create multiple design alternatives and Ansys Mechanical to analyze these designs. The new design has a crushing capacity of 270 metric tons per hour and has the same weight as the previous model with a crushing capacity of 245 metric tons per hour. Ansys HPC played a key role by reducing the time to solve each design alternative from 21 hours to 1 hour.”

Juuso Nänimäinen

Structural Analyst / Metso Outotec

Ansys tools enabled Metso to design a higher capacity – but not heavier – jaw crusher while reducing design iteration time by 94%

Metso jaw crushers reduce large rocks into smaller rocks or gravel by holding material between two solid surfaces and exerting enormous force — up to several meganewtons — to fracture the material. Metso engineers set out to substantially increase the work capacity of a new jaw crusher model while maintaining the same weight as the previous generation, which is crucial because jaw crushers are typically transported on public roads where load weights are limited.

/ Challenges

Metso used simulation in the design of previous products, but the geometrical complexity of jaw crushers limited the number of different alternatives that could be explored within time constraints. In the past, for example, it took 1,246 minutes (almost 21 hours) on a dual-core machine to solve a typical moving jaw non-linear model with 7 million degrees of freedom and 1.5 million elements.

/ Technology Used

- Ansys SpaceClaim Direct Modeler
- Ansys Mechanical
- Ansys High-Performance Computing (HPC)

/ Engineering Solution

Metso engineers used Ansys SpaceClaim to quickly define the geometry of alternative designs using a direct modeling approach that creates the geometry as features or individual operations without requiring a network of constraints between the features. They solved each model in Ansys Mechanical on a high-performance computing (HPC) platform in only 78 minutes, 16 times faster than previous simulations. The HPC platform incorporated two Intel 10-core processors, 192 GB RAM and two NVIDIA Tesla graphics processing unit (GPU) acceleration cards. The ability to quickly generate and evaluate alternative designs made it possible for Metso engineers to rapidly improve the performance of the new design.

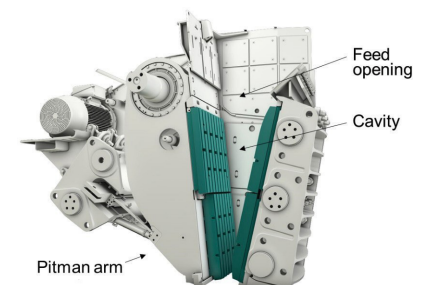
/ Benefits

Metso’s Ansys Mechanical PrepPost plus solver plus HPC license configuration makes it possible to do pre- and post-processing while the solver is running. By using Ansys HPC and with the assistance of Ansys channel partner EDRMedeso, Metso obtains more accurate results in substantially less time:

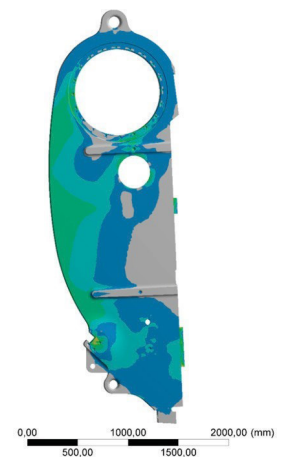
- Generated alternative designs seven to 20 times faster.
- Reduced analysis time from 4 hours to 15 minutes for small, yet non-linear models.
- Reduced analysis time from 4 days to 6.5 hours for large non-linear models with greater than 10 million degrees of freedom.

/ Company Description

Metso is a leading provider of equipment for the mining, oil and gas, and aggregates sectors. In 2020, Metso’s net sales totaled EUR 3.9 billion. Metso employs approximately 16,000 people in 50 countries.



In Metso Nordberg C series jaw crushers, incoming material is crushed between the jaw crusher’s fixed movable die plates through advancing and retreating motions of the jaw crusher’s Pitman arm



Metso engineers iterated the design to obtain even stress distribution from the stone crushing load

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