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CREO AND ANSYS: LIXIL'S JOURNEY

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PTC & ANSYS PARTNERSHIP

Revolutionize product design by removing the barriers between CAD and CAE

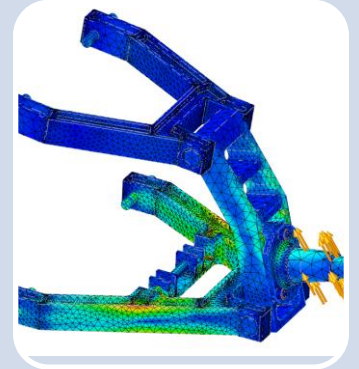
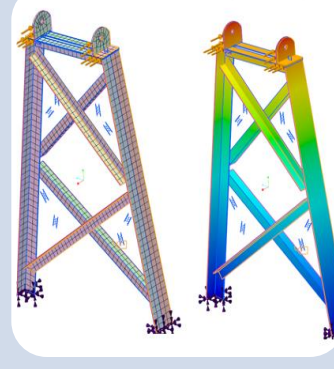
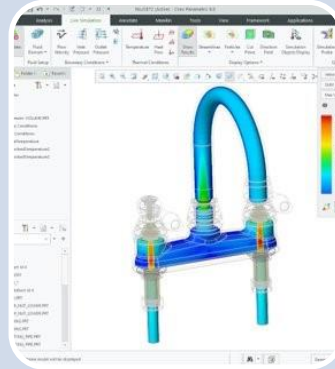
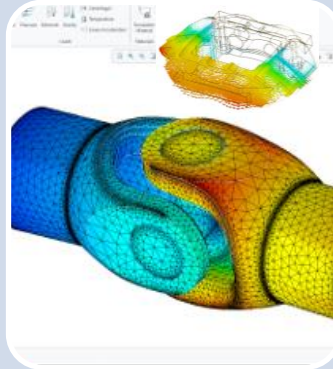
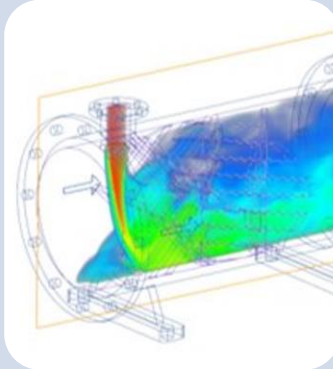
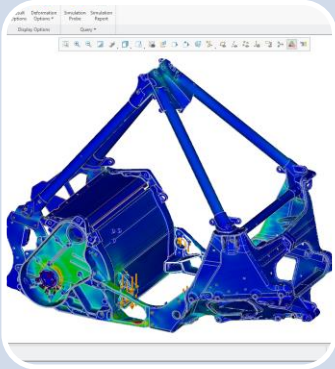
Partnership provides best
and broadest portfolio
of engineering
simulation software



PTC and ANSYS put best in
class design and simulation
capabilities at the fingertips
of every Design Engineer

EVOLUTION OF POWERED BY ANSYS

STRATEGIC RELATIONSHIP DELIVERING WORLD CLASS SIMULATION



Creo 6

Creo Simulation Live Launch

- Real-time Simulation for Structure, Modal and Thermal

Backported to Creo 4.0 and 5.0

Creo 7

Creo Simulation Live with Fluids

- Velocities, pressure, internal and external flow
- Fluid Domain Creation
- Streamlines, Particles and multiple result types

Creo 7.0.2.0

Creo Ansys Launch

- High Fidelity Simulation using Ansys platform
- Structure, Modal and Thermal
- Including Idealizations

Creo 8

Steady State Fluids Simulation with CSL

- UI/UX improvements
- Unique PTC format for import into Ansys Workbench

Creo 9

CSL

- Multi-physics
- Lattice geom support
- Contact

Creo Ansys

- Shell elements
- Inertia Relief

Creo 10

Creo Ansys Advanced

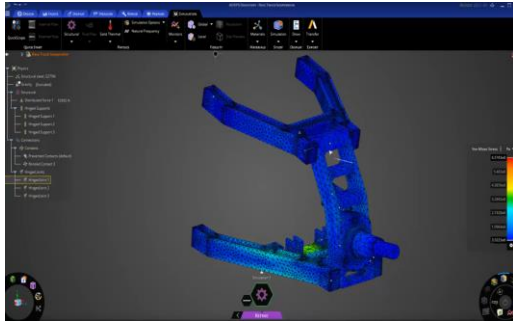
- NL Contact
- NL Materials
- Multi-physics

CSL

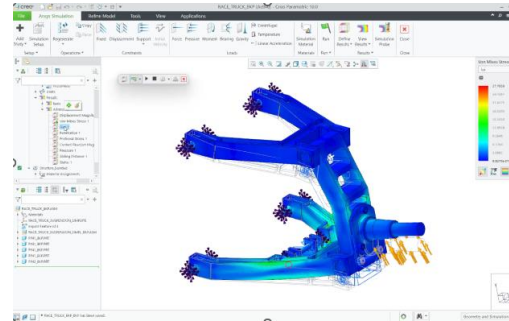
- New Result types
- Improved contact detection (includes Creo Ansys)

ANSYS/PTC TECHNOLOGY RELATIONSHIP

Ansys Designer
Simulation Products



Creo Designer
Simulation Products



*Real time design-integrated simulation
&
Easy-to-use high-fidelity simulation*

Ansys GPU-
based Solvers

*Proven algorithms
re-implemented for massively
parallel GPU architectures*

Workflow, Meshing and
Solution Automation

Ansys Core
Solvers

*Gold-standard solvers with
50+ years of technology
development*

› TOUCHING OVER ONE BILLION LIVES EVERY DAY

An international presence with some of the **most trusted brands** in the Kitchen and Bath Industry, including **American Standard, GROHE, DXV & INAX**



TOUCHING THE LIVES OF
OVER 1 BILLION PEOPLE



150+ COUNTRIES
GLOBAL PRESENCE



APPROX. 55,000
EMPLOYEES



15
PRODUCT BRANDS

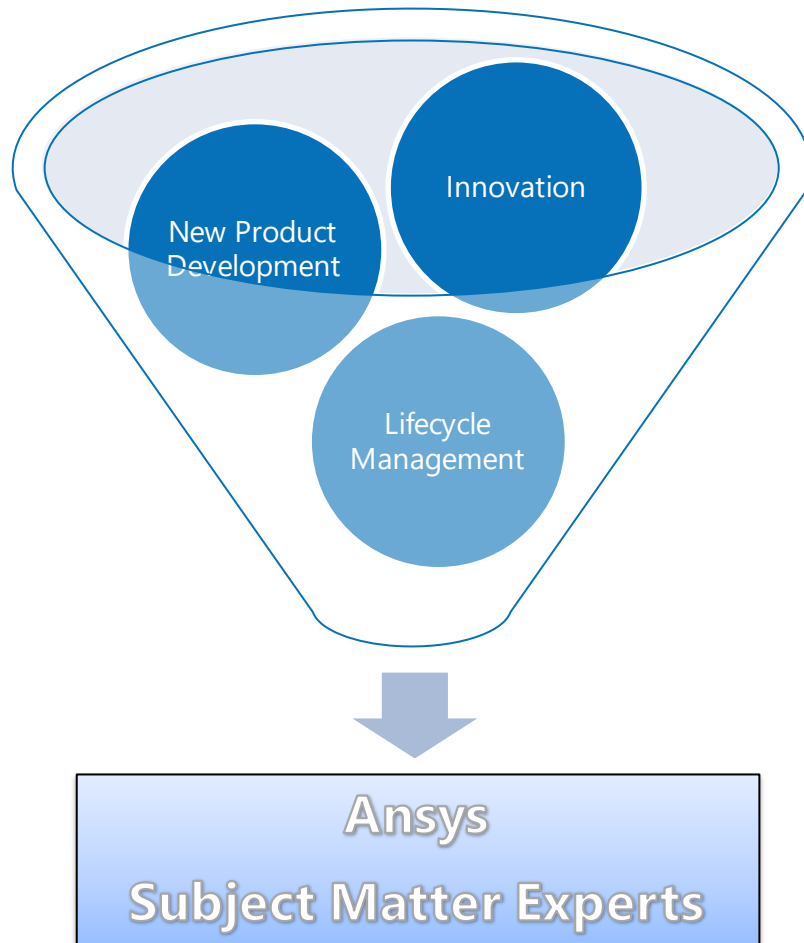


100+ YEARS
BRAND LEGACY

› AGENDA

- 1) **Traditional Test Centered Development Approach**
- 2) **Evolution of LIXIL's Development Process**
- 3) **Power of Model Based Product Development; Simulation Focused**
- 4) **Simulation Centered Development Approach**
- 5) **Simulation Tools Used by LIXIL**
- 6) **Simulation Examples & Results**
- 7) **Value to LIXIL**

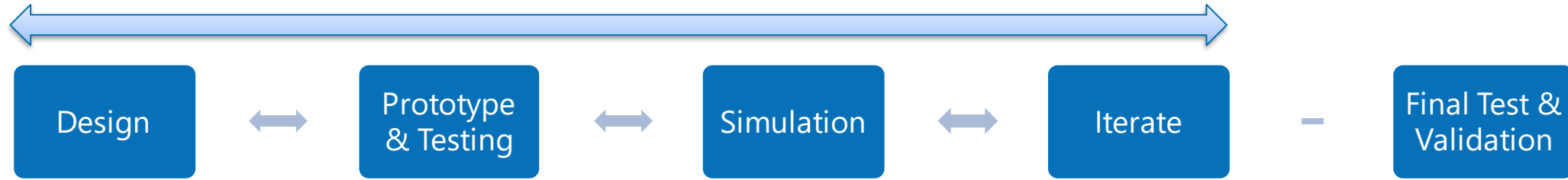
› TRADITIONAL TEST CENTERED DEVELOPMENT APPROACH



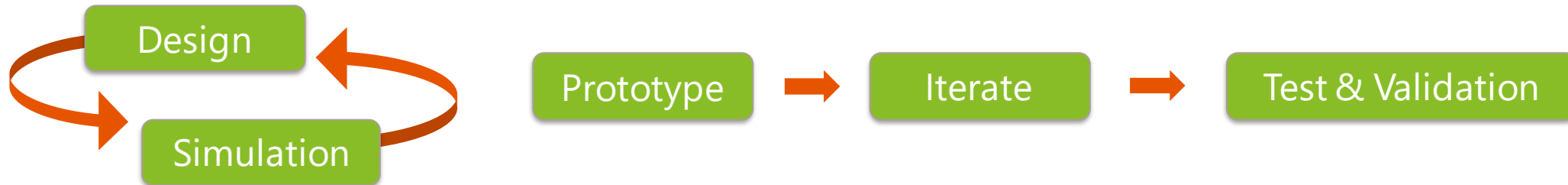
- › Small team w/ 1-2 subject matter experts
- › Utilizing full Ansys software capabilities only
- › Simulation results were critical to driving product innovation platforms and products.
- › **Product Design Engineers design the product and hand off to CAE Engineers for analysis before moving to prototype.**
- › **CAE Engineers perform desired analysis, suggest recommendations/carry out necessary modifications to geometry in Ansys modeler and perform design iterations.**
- › CAD file would import/export from Creo to Ansys back and forth.
- › A lot of down time in this process

> LIXIL PRODUCT DEVELOPMENT PROCESS

Traditional Test Centered Development Approach



Simulation Centered Development Approach



Simulation-driven design empowers engineers to quickly explore more alternatives with confidence.

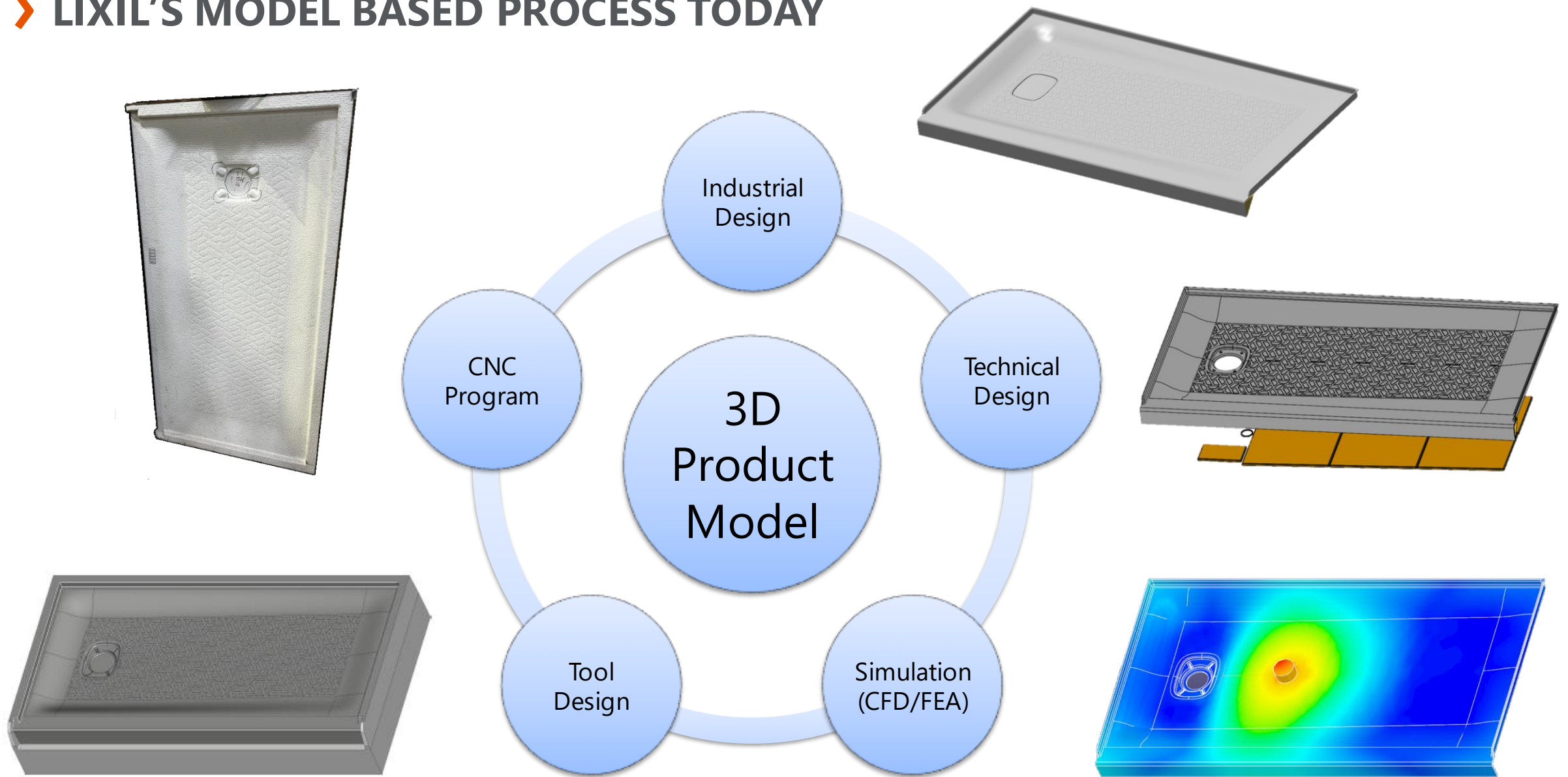
ENGINEER

BREAKTHROUGH INNOVATION

COST
STRENGTH
WEIGHT

Simulation-driven design results in more innovation, higher quality, and increased efficiency.

> LIXIL'S MODEL BASED PROCESS TODAY



› SIMULATION CENTERED DEVELOPMENT APPROACH

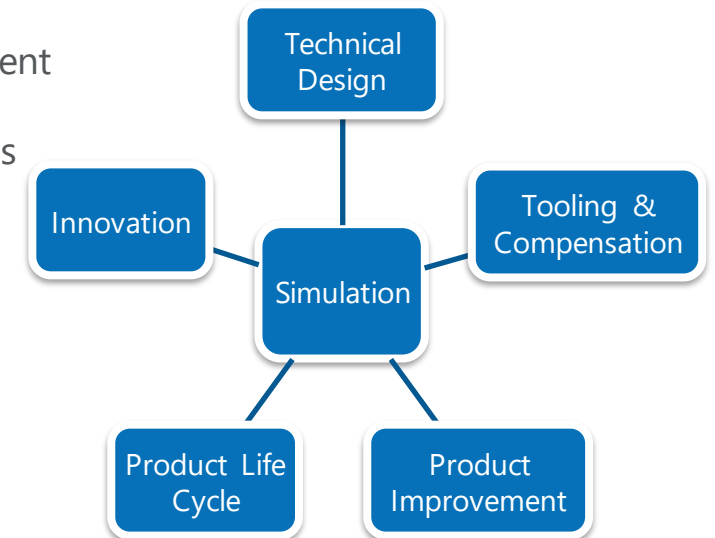
› Design Engineers: 20+

- Leverage Creo Ansys Simulation tools
- Provide instant design direction for quicker developments
- Model Based Development



› Simulation Subject Matter Experts: 2

- Experts in Simulation regardless of the Simulation tool
- Main concentration is in Ansys
- Support Design Engineers using CREO Ansys Simulation
- Develop new simulation capabilities
- Solve higher complexity problems
- Innovation development
 - CAE Platforms
 - Product Innovations



> ANSYS TOOLS USED BY LIXIL

Creo Simulation Live

- Creo Simulation Live is the integration of ANSYS Discovery technology into Creo, enabling near instantaneous static structural, thermal and modal simulation

Creo Ansys Simulation

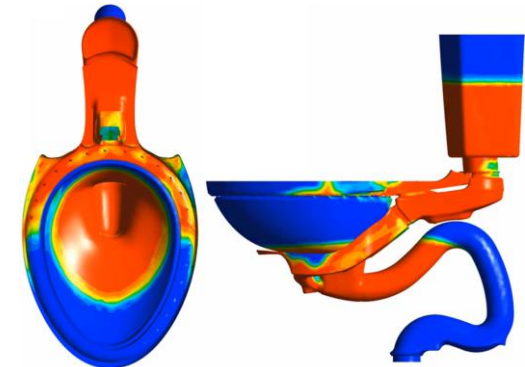
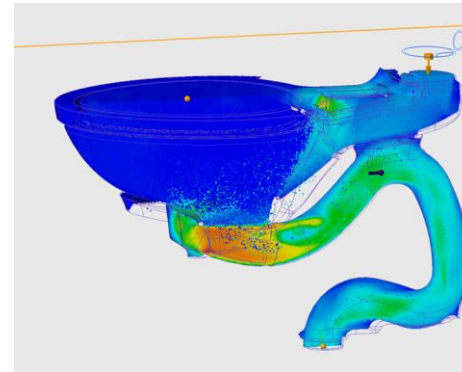
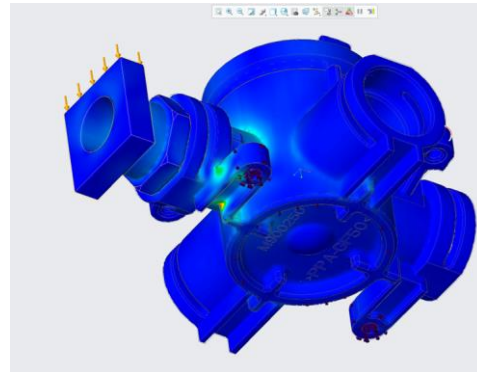
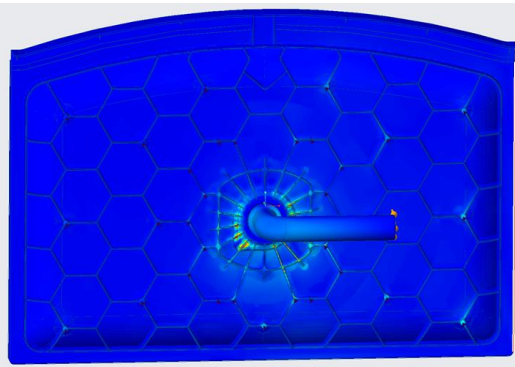
- Fast simulation modeling and setup
- Automated meshing and contact handling
- High-fidelity results using Ansys powered solver and meshing technology running in Creo

Creo Simulation Live Plus

- Creo Simulation Live Plus is the integration of ANSYS Discovery technology into Creo, enabling near instantaneous fluid flow simulation

Ansys Mechanical Fluent/CFX

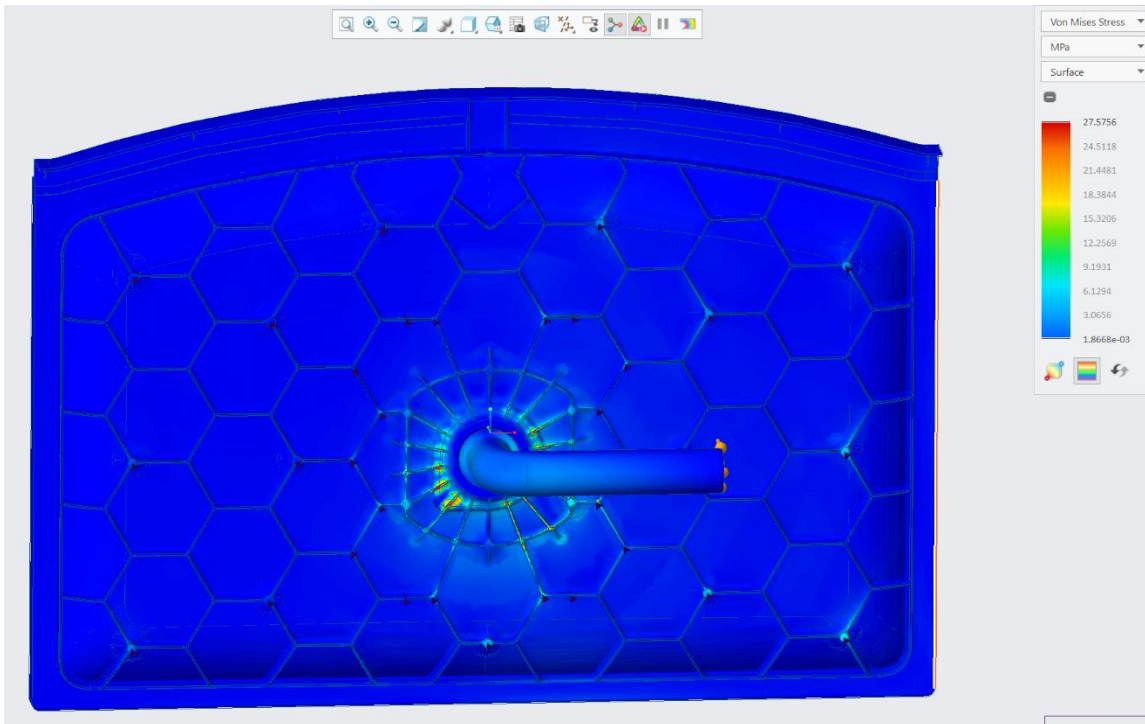
- Capture full physics High Fidelity solutions
- Problem involving higher complexity
- Multiphysics, Multiphase, Non-Linear
- DOE, Topology Optimization, Design Exploration, DOE, etc.



➤ CREO SIMULATION LIVE- PRELIMINARY FEA FOR TORQUE TEST ON SHOWER BASES

Objective:

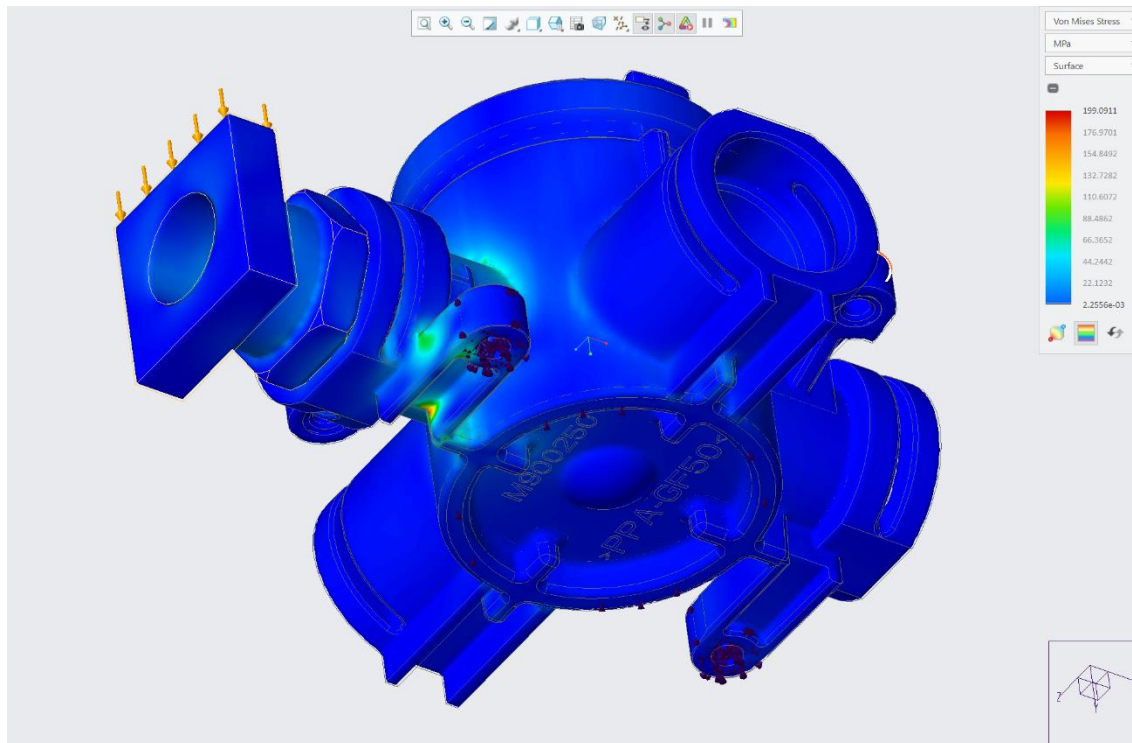
- Simulate torque test on shower base to identify weakest point in the existing design
- Compare simulation results with available test data.
- Perform LIVE modifications to improve design strength.



➤ CREO SIMULATION LIVE- PRELIMINARY FEA FOR MIXING VALVE

Objective:

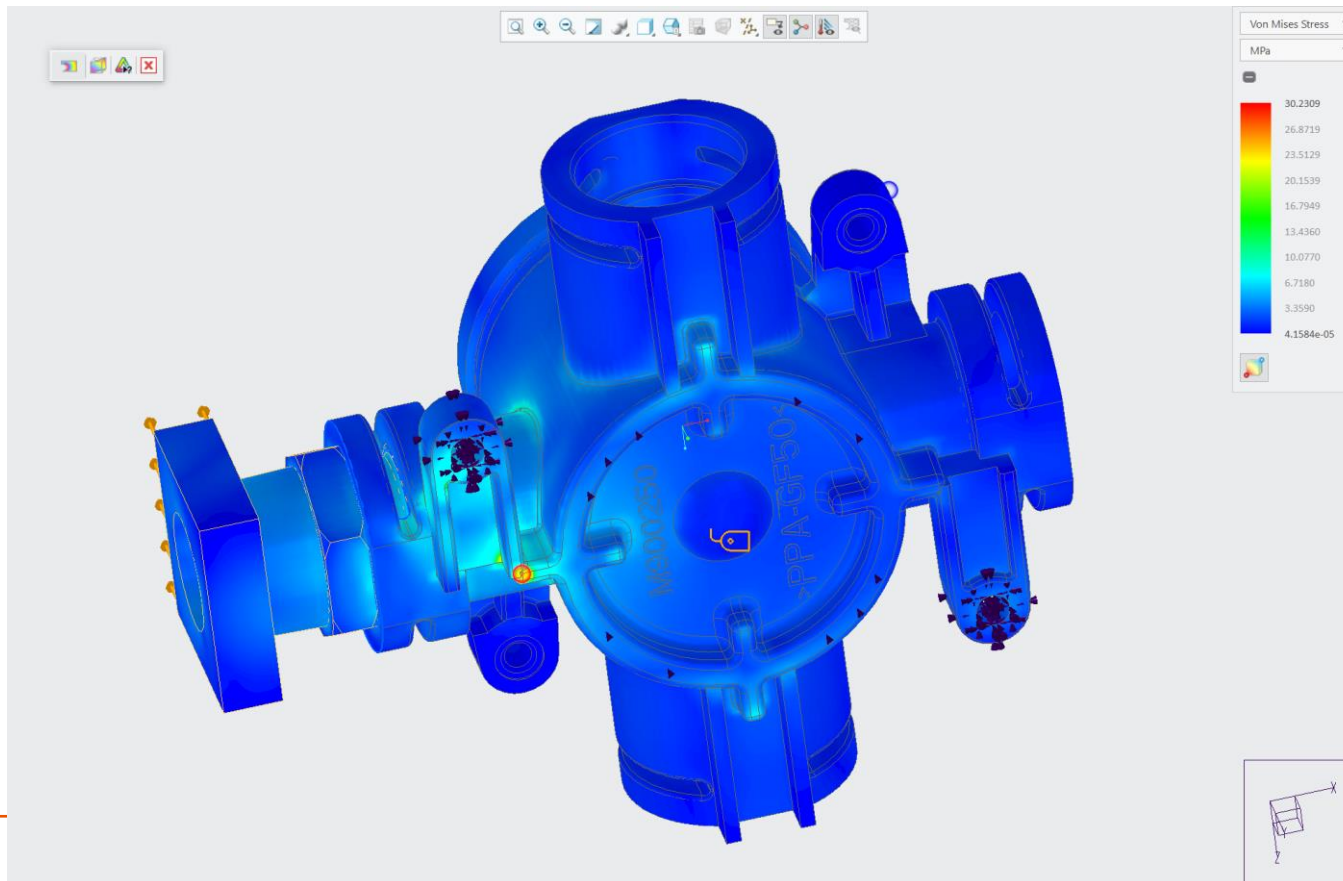
- Change of material as a part of Cost Improvement project - from Brass to Plastic
- Identify weakest point in the existing design and perform LIVE modifications to improve design strength



› CREO ANSYS- FEA FOR MIXING VALVE

Objective:

- Change of material as a part of Cost Improvement project - from Brass to Plastic
- Determine structural strength for modified design enabling design modifications in required regions.



› CREO SIMULATION LIVE PLUS- FLOW THROUGH TOILET

Objective:

- Visualize flow through toilet internal to get design direction on internal water pathways

› WHY IS THIS VALUABLE TO LIXIL?



Save months worth of time



Reduced software transfers



Speed to market



Increase simulation capabilities



Real time product analysis for reduced design iterations



Improve product quality and innovation focus



QUESTIONS?

Thank you! You can find me at:



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THANK YOU

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