Real Life Challenges with Simulation Data Management (SDM)

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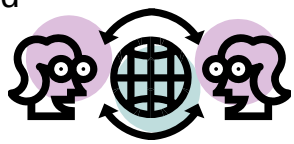
Cummins Filtration - Background

- We make Filtration, Coolant and Fuel Additives products.
- Global Company – many Technical centers.
- Our Technical centers work collaboratively.

Our Simulation Needs

- Increased emphasis on simulation-led design.
- We use 10+ tools for simulation.
- Lead time requirements are only getting shorter.
- Data generated needs to be shared globally.
- Members of the same team are located in multiple locations.



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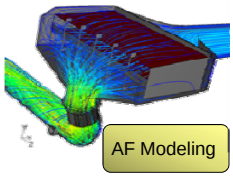
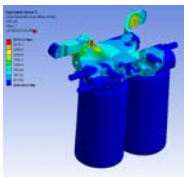
Simulation Examples

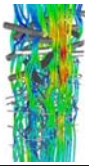


AF Modeling

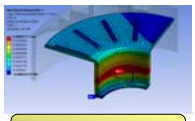


Multi-body Contact

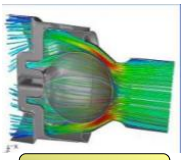
Liquid Filter flows



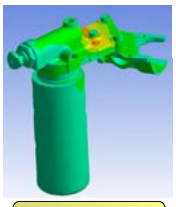
Media design



Thermal Expansion



Check valve flow



Vibration Fatigue

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Our SDM Needs

- Easy to use
- Share large amounts of data instantaneously
- Quickly find historical and current simulation data
- Two-way integration with PLM/CAD system
- Global workflows that don't hinder quick turnarounds
- Comply with our security standards
- Easy access control and audit
- Comprehensive visualization capabilities
- Less TCO – infrastructure, licensing and maintenance

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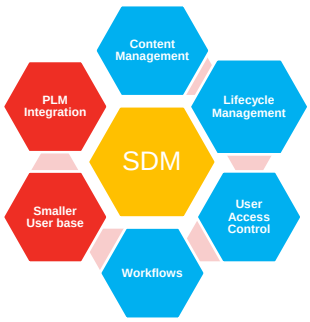
PLM and SDM – Compliment or Compete?



TCO Standpoint:

- Smaller user base, though need better infrastructure for SDM.
- For global companies, maintaining two systems can be very cumbersome.

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What's Out Of The Box (OOTB)?

- Customizations are costly, hard to maintain – emphasis on OOTB.
- Difficult to understand customization / configuration.
- Lack of clarity can be a very costly endeavor.

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Challenges with Large Datasets

- Traditionally, significant time spent on FTPs.
- Transfer from Cluster to local machine?
- Even with a SDM tool, limitations around frequency of transfer and the real need to transfer.
- Sophisticated DOE/optimization based solves create multiple folders.
- Data sizes range from 250MB to 10GB+.

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Challenges with Ease of Use

- Data stored locally – should be seamless to add data.
- Simple user interface, 80-20 rule?
- Open Questions:
  - Need for release management team to ensure effective use of tool?
  - What are the key factors that will drive users to “want” the tool vs just another data management “you must” use?

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Visualization Challenges

- Boundaries in terms of ‘which tools’ are well defined in the PLM space, not for SDM space.
- Limitations having a universal viewing format – as simulation can mean anything.
- Remote solves complicate the scenario further.

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Licensing Complications

- Licensing of simulation tools only seems to get complicated
  - Node locked / Floating
  - Concurrent Local / Global / Facility
  - Proximity based licensing
  - Time Zone based licensing
- SDM will manage data from multiple simulation tools, software license compliance is another story.
- Tricky to understand licensing needs to use SDM to run simulations remotely.

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Other Implementation Challenges

- Business case approach that has been most effective in generating executive interests for funding?
  - Process Improvement = Fast Design
  - Lost Data = Reduces Reuse
  - Security = Lost IP/$
- Multi-Business Unit vs One Business Unit? What are your experiences for effective implementation?

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Possible Solutions

- SDM could be a module of PLM, not a standalone.
- Result files need to be managed better – may be in chunks? Creating lighter weight result files automatically?
- Emphasize on ease of use – compare value of functionality to ease of use.
- Localized user based vaults?
- Simplify licensing practices.

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