Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

http://aucache.autodesk.com/social/visualization.html

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.
Cross-Product Collaboration: Design and Analysis of a Composite Motorcycle Swingarm

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Class summary

Every design and analysis project contains a unique set of challenges that often necessitate a clever workflow utilizing many different pieces of software. In this class we will discuss how Autodesk, Inc., products were used in the design and analysis of a composite swingarm for an electric motorcycle. In particular, you will learn how the Fusion 360 app, Simulation Composite Analysis software, Autodesk 360 cloud-computing platform, and a labs project called Arro are enabling the Design and Analysis Team to digitally prototype this advanced swingarm.
Key learning objectives

At the end of this class, you will be able to:

- Gain an appreciation for the wide range of Digital Prototyping tools offered by Autodesk
- Discover how different Autodesk products can be combined to solve unique projects
- Discover how the cloud facilitates collaboration
- Discover Autodesk products that you may not be aware of
LS-218-1

- World’s fastest production motorcycle
  - 218 mph
Aluminum swingarm

- 3 aluminum parts bolted together
- Knew swingarm was overbuilt
- Goals:
  - Weight reduction
  - Maintain stiffness characteristics
- Target material: Composite
Why composites?
Challenges
Mesh ready geometry
Mesh ready geometry
Decentralized project team

I’d like to review the track 1 assembly but I don’t have the right software. Can we schedule a time for a screen share?

I’m new to the team, can someone send me all of the project files?
How to manufacture?

- Aluminum swingarm can be machined from a block of aluminum
- There are many ways to fabricate a composite material and defects are difficult to avoid for complex geometry
Composites are non-isotropic

Aluminum

\[ E = 1.0 \times 10^7 \text{ psi} \]
\[ v = 0.33 \]
\[ G = 3.76 \times 10^6 \text{ psi} \]

IM7/8552

\[ E_{11} = 2.07 \times 10^7 \text{ psi} \]
\[ E_{22} = E_{33} = 1.65 \times 10^6 \text{ psi} \]
\[ v_{12} = v_{13} = 0.324 \]
\[ v_{23} = 0.461 \]
\[ G_{12} = G_{13} = 6.89 \times 10^5 \text{ psi} \]
\[ G_{23} = 5.65 \times 10^5 \text{ psi} \]

Directional dependence!
Extensive family of products
Autodesk Labs

Technology Previews Available to the Community At Large

Autodesk Labs, part of the Office of the Chief Technology Officer (CTO), is our public process for sharing innovative new technologies and collaborative development. The user feedback that you provide to Labs is really on ideas while they’re still in an early conceptual stage. The process is applied to technology that is commercially relevant to customers in design — whether they’re involved in architecture, manufacturing, civil engineering, movies, games or other industries. The best way to learn about Autodesk Labs is to start experimenting yourself.

Try the Technology Previews

Use the links below to join the various technology previews. Joining a technology preview takes you to its home page where you can access downloads, project news, and feedback forums.

2D to 3D Tool for Inventor
Create 3D models in Autodesk Inventor from 2D data.

Corridor Optimization for InfraWorks 360
Use equations to find the most efficient roadway alignment.
Product Focus
A360

- Project-based collaboration tool
- Cloud-based
A360 - Dashboard

Projects

Pinned

Active

Lightning_Swingarm

And set up of base OS without... ... Continue reading

Paul

Corporate Development Integration

Paul has created Corporate Development Integration project

Dave Wegner

Cloud Ops (IAAS)

Naming Convention Overview. The naming convention should allow for flexibility and support automation whenever possible. Flexibility may require re-purpose of servers and set up of base OS without... ... Continue reading

DLS Simulation All

DLS Simulation Mesh...
Application to swingarm project

- Total nodes = 741,168
- Total elements = 526,005
Fusion 360 | De-featuring
Fusion 360 | Toolpath Generation
SimStudio

- SimStudio is a model preparation tool for:
  - Simulation Mechanical
  - Simulation CFD
  - Simulation Moldflow
- Geometry cleanup, repair, and simplification as well as geometry editing tools
- Formerly Project Arro on Autodesk Labs

Sign up for beta testing at: beta.autodesk.com
CAD and CAE Connections
Read in geometry and push to Simulation Mechanical, CFD, or Moldflow
Rapid Model Defeaturing and Simplification
Run simulations faster by eliminating unnecessary detail
Fast Design Changes
Edit geometry to adjust your model or consider “what if” scenarios

Combine, modify, and update CAD data

Directly edit model with simple push/pull commands

Create design variations quickly and easily
Simplified geometry = cleaner mesh
Simulation Composite Analysis

- Plug-in to FEA packages
- Used to simulate progressive failure in composite structures
  - Progressive failure is a term used to describe the sequence of damage initiation followed by damage evolution
Progressive Failure Demonstration

Wheel mount
\( \theta z = 11.5^\circ \)

Motor mount
\( U_x = U_y = U_z = 0 \)
Future Direction
3D printed core

- Keep the same basic geometric profile as the aluminum swingarm
- Print a core
- Cure composite skin to the core
Algorithmic optimization

- Use the power of algorithmic assisted design to optimize the core structure
- Project Dreamcatcher
Summary of tools used

- A360
  - Collaboration, file repository, “living history”
- Fusion 360
  - Major geometry modifications
- SimStudio
  - Geometry cleanup
- Simulation Composite Analysis
  - Structural analysis, progressive failure
Voice of Customer

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9 am - 6 pm, Dec. 2-4
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