



IoT is PLM

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VP PLM Solutions Management

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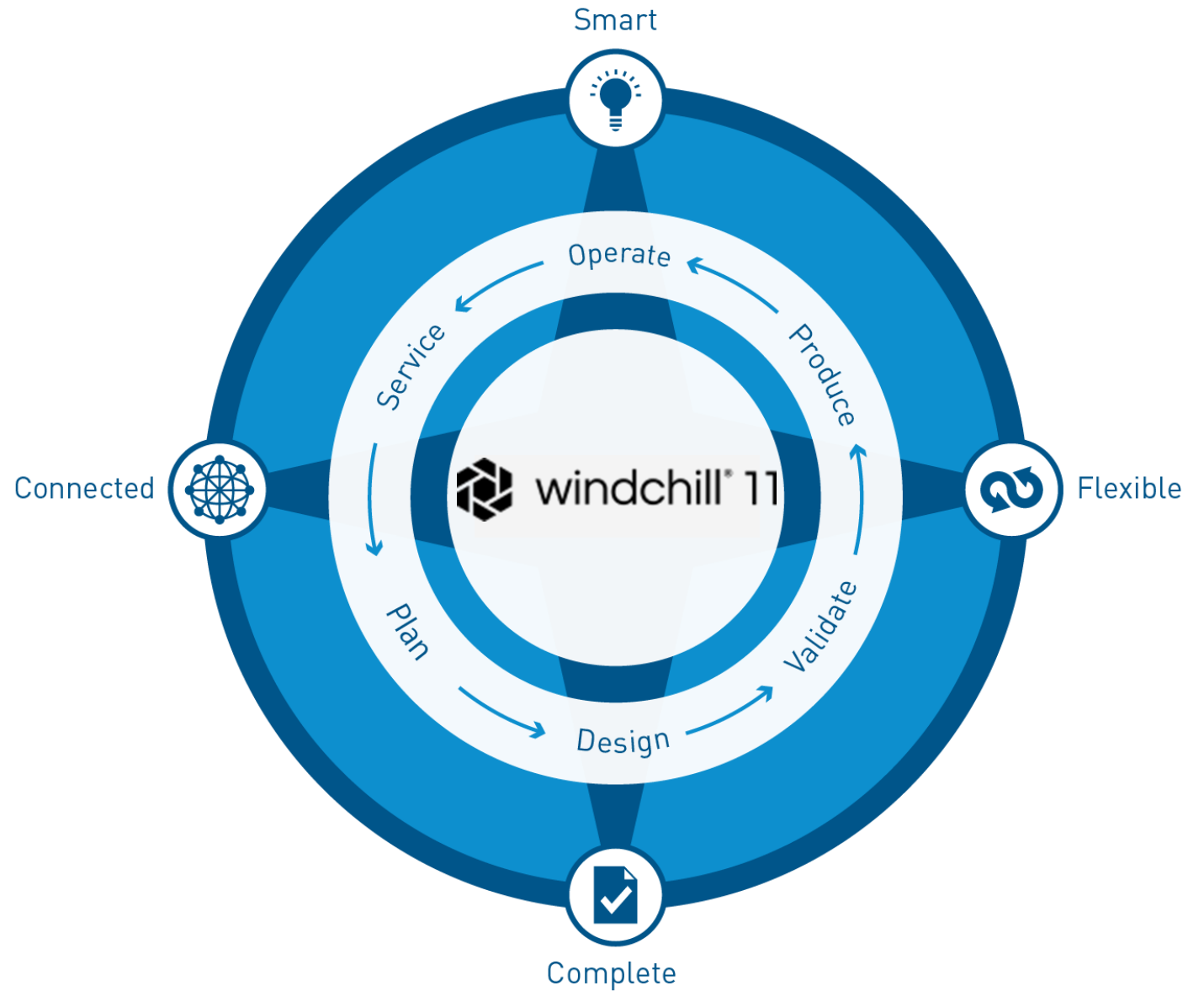


AGENDA

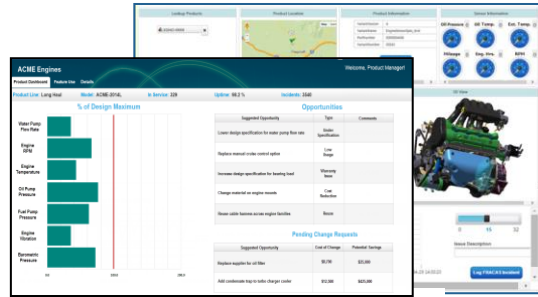
- Introduction – The evolution of PLM
- PLM Extensions for ThingWorx
- Leveraging ThingWorx mash-up in Windchill 11
- Use Case examples
- Conclusion & Q&A

THE EVOLUTION OF PLM

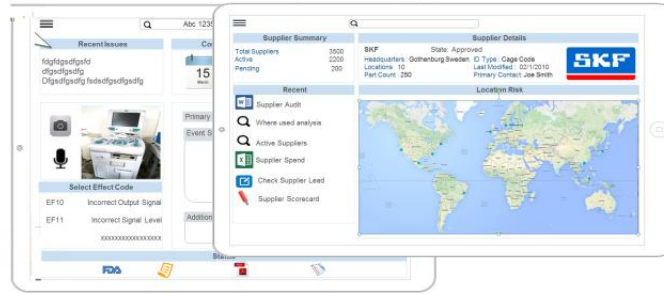
PTC® Windchill® 11
Smart Connected PLM



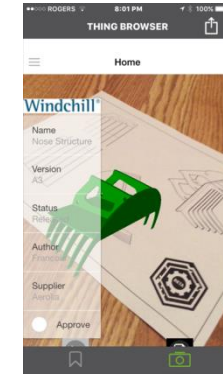
PTC CONNECTED ENTERPRISE APPLICATIONS



Connected



Rapid Development



Augmented Reality



View Supplier Where used



Classification Search



View & Measure in 3D





View Design Files



View Drawing



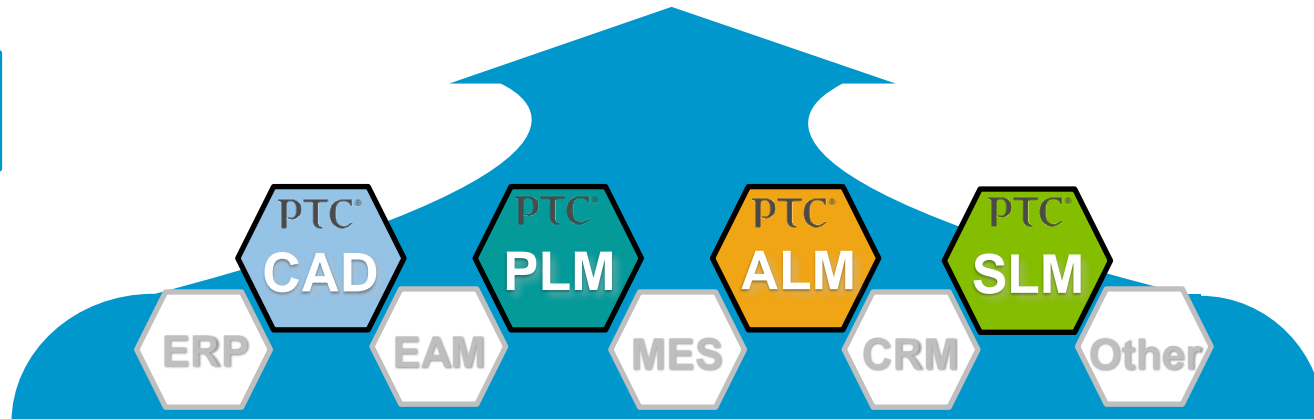
View Part Structure

PTC[®] Navigate

PTC[®] Navigate

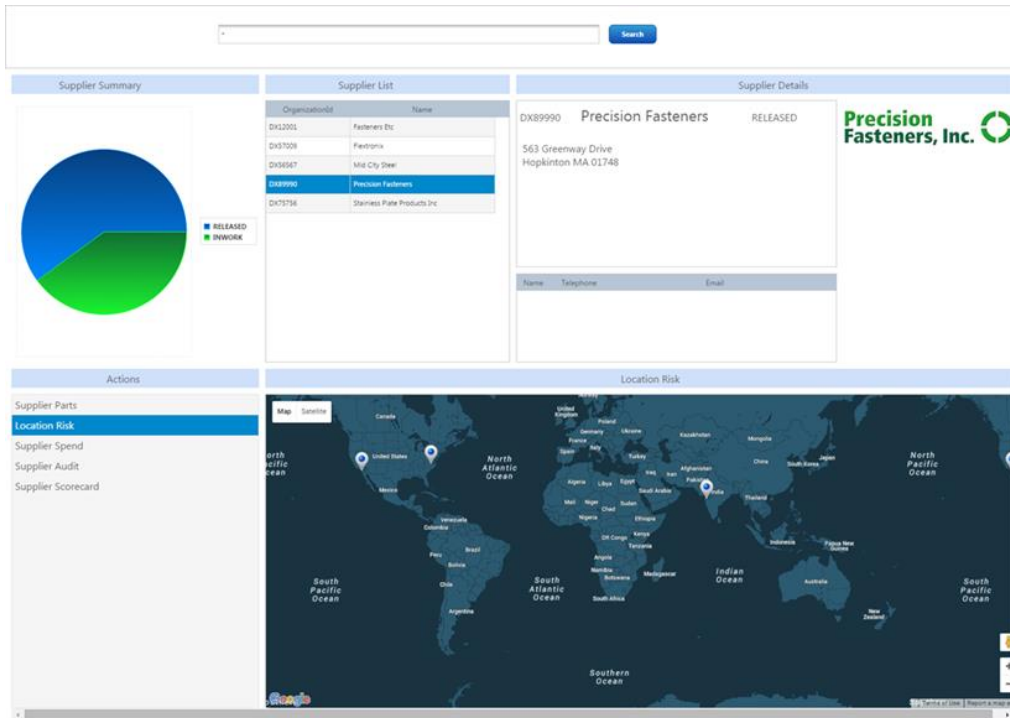
PTC Solution Extensions

Introduction to PTC Navigate
Wednesday June 8, 8AM room 209



PTC[®] Windchill[®] 11
Smart Connected PLM

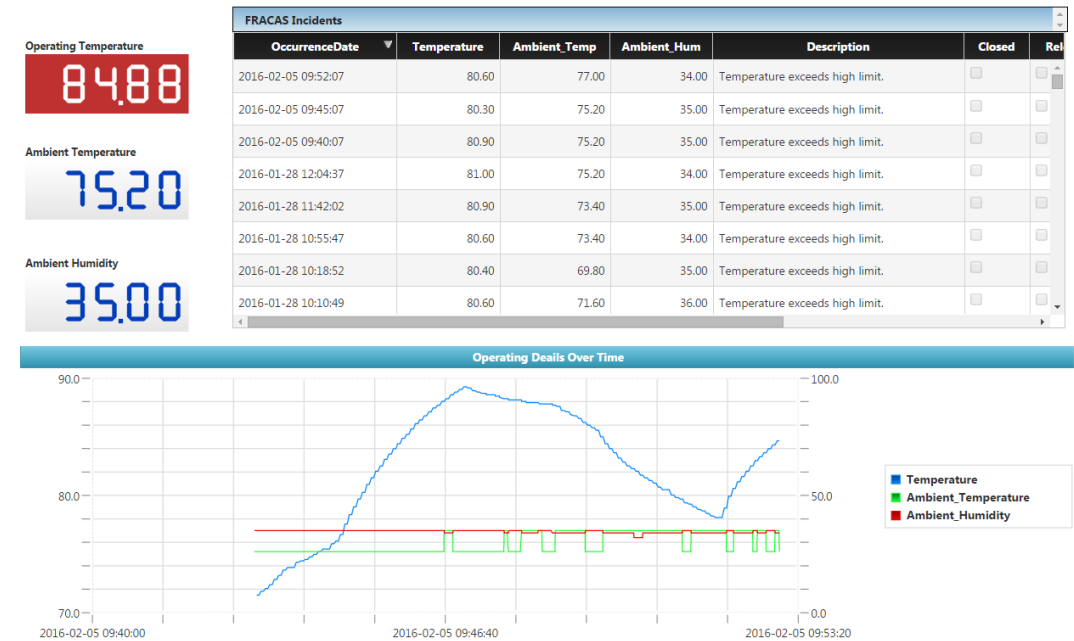
PLM EXTENSIONS FOR THINGWORX



Windchill Extension for ThingWorx

Quickly and easily leverage product information managed in Windchill

ThingWorx Windchill Quality Solutions – ThingWorx Extension Resource



Windchill Quality Solution Extension for ThingWorx

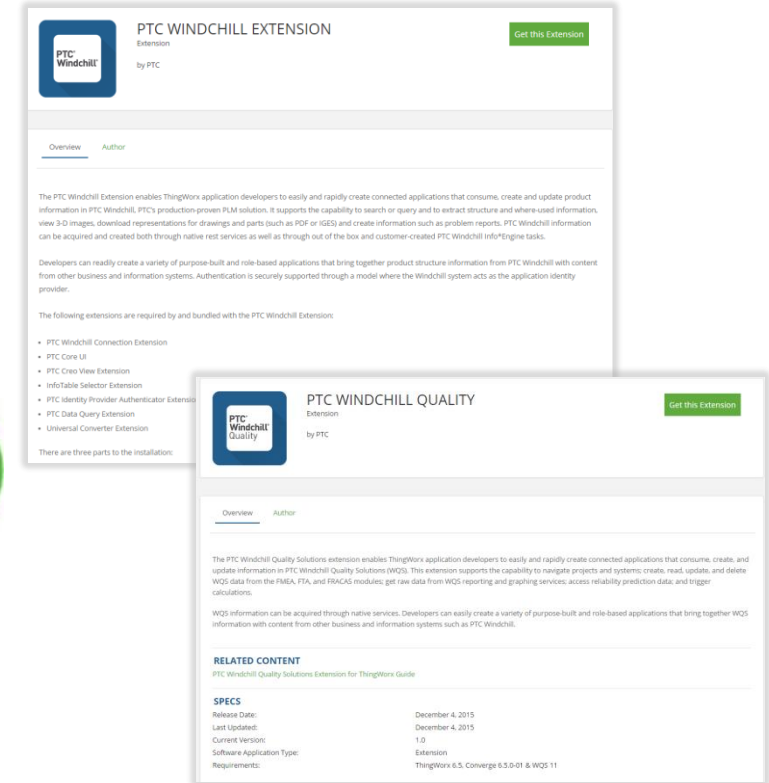
Learn from the product's operational behavior



PLM EXTENSIONS FOR THINGWORX



- Platform Support *
 - Windchill 10.2 M020 or later, and 11
 - Windchill Quality Solution 11
 - ThingWorx 7.1
- Available from [ThingWorx Marketplace](#)
- Pricing/Licensing
 - No cost for Windchill Extensions
 - Customer must have requisite Windchill and ThingWorx licenses or PTC Navigate “App Dev Kit” to support capabilities exposed.
- Leverage Windchill Extension to extend PTC Navigate with “App Dev Kit”
Navigate Add-on License
 - Full use of ThingWorx composer for application & widget development
 - Exclude “Connected Devices”



TECHNICAL CAPABILITIES WINDCHILL EXTENSION FOR THINGWORX



- Access Windchill BOM information
- Access Windchill properties
- Get published formats
- Specialized “widgets”
 - Structure tree table
 - Creo View visualization
- Info*Engine task service wrappers
 - Execute out of the box Info*Engine Tasks
 - Execute custom Info*Engine Tasks

The screenshot displays the Windchill extension interface. On the left is a BOM table with columns for Name, Number, Version, # in Stock, and \$ Cost. The table lists various assembly components like '01-2_engine.asm', '01-2_crankshaft.asm', and '01-2_head.asm'. A callout box points to the table with the text: "Obtain and display BOM Structure using navigation criteria".

On the right is a Properties panel showing details for the selected part '01-2_head.asm', including parentId, objectId, name, usesOccurrenceIdentifier, defaultUnit, view, type, version, and number. A callout box points to this panel: "Obtain properties, based on structure or visual selection".

Below the properties panel is a 2D visualization of the part. Callout boxes point to buttons: "Export Properties CSV" and "Create Problem Report", with the text: "Create Windchill objects such as a problem report using Info*Engine tasks".

Below the 2D view is a 3D visualization of the engine assembly. Callout boxes point to buttons: "Download any published representations such as PDF, IGES or STL" and "3-D visualization widget. Manipulate and use to facilitate decision making based on color coding driven by attribute values from Windchill and/or external systems".

At the bottom, a callout box points to the 3D view and BOM table: "Bi-directionally navigate through 3-D view and/or BOM Structure".

Another callout box points to the 3D view: "Launch in Creo View to measure, explode, section...".

At the bottom of the BOM table, there is an "Export BOM CSV" button.

TECHNICAL CAPABILITIES WINDCHILL QUALITY SOLUTION EXTENSION FOR THINGWORX



- Create, Read, Update and Delete for all “web based” WQS data
 - FMEA, FTA, FRACAS
- Access to Reports and Graphs
 - Raw data from WQS reporting and graphing available through API
- Visibility of Reliability Prediction Data

PTC® Windchill® 11 Smart Connected PLM

PTC WINDCHILL QUALITY EXTENSION

OVERVIEW

The PTC Windchill Quality Extension provides a comprehensive view of the FMEA, FTA, and FRACAS data, enabling users to analyze and predict quality issues. WQS information is accessible through role-based systems.

Failure Mode	Value	Field Failure Rate
TOP LEVEL PROCAM	26.26121	0.00000
Failure Mode 1	0.00000	0.00000
Failure Mode 2	0.00000	0.00000
Failure Mode 3	0.00000	0.00000
Failure Mode 4	0.00000	0.00000
Failure Mode 5	0.00000	0.00000
Failure Mode 6	0.00000	0.00000
Failure Mode 7	0.00000	0.00000
Failure Mode 8	0.00000	0.00000
Failure Mode 9	0.00000	0.00000
Failure Mode 10	0.00000	0.00000
Failure Mode 11	0.00000	0.00000
Failure Mode 12	0.00000	0.00000
Failure Mode 13	0.00000	0.00000
Failure Mode 14	0.00000	0.00000
Failure Mode 15	0.00000	0.00000
Failure Mode 16	0.00000	0.00000
Failure Mode 17	0.00000	0.00000
Failure Mode 18	0.00000	0.00000
Failure Mode 19	0.00000	0.00000
Failure Mode 20	0.00000	0.00000
Failure Mode 21	0.00000	0.00000
Failure Mode 22	0.00000	0.00000
Failure Mode 23	0.00000	0.00000
Failure Mode 24	0.00000	0.00000
Failure Mode 25	0.00000	0.00000
Failure Mode 26	0.00000	0.00000
Failure Mode 27	0.00000	0.00000
Failure Mode 28	0.00000	0.00000
Failure Mode 29	0.00000	0.00000
Failure Mode 30	0.00000	0.00000

RELATED CONTENT

[PTC Windchill Quality Solutions - User Guide](#)

SPECS

RELEASE DATE: DECEMBER 4, 2015
LAST UPDATED: DECEMBER 4, 2015
CURRENT VERSION: 1.0
SOFTWARE APPLICATION TYPE: EXTENSION
REQUIREMENTS: THINGWORX 6.5, CONVERGE 6.5.0-01 & WQS 11

PUTTING IT TOGETHER ... WINDCHILL EXTENSIONS FOR THINGWORX



Bi-directional connection to:

Connected - Tailored - Actionable

Connected Devices



Windchill



Windchill Quality Solution



Lookup Products
EGSNO-00000

Product Location
Map | Street View
Flagstaff

Product Information
VariantVersion: A
VariantName: EngineSensorSpec_Arid
PartNumber: 000004406
VariantNumber: 00102
Load Digital Twin

Sensor Information
Oil Pressure: 0, Oil Temp.: 0, Ext. Temp.: 0
Mileage: 0, Eng. Hrs.: 0, RPM: 0

Product Structure

Number	Name	Pred. MTBF	Actual MTBF	Pred. FR	Actual FR
000004406	twx_engine	3214	1120	311.110935	893.039419
000004341	twx_flywheel	2e+006	1e+006	0.511537	0.837536
000004451	twx_distributor	2e+006	3e+006	0.439154	0.292745
000004351	twx_aux_drive_2	3e+006	7e+006	0.286938	0.151212
000004361	twx_water_bypass	1e+008	8e+007	0.008675	0.012810
000004499	twx_intake_manif	295386	235821	3.385400	4.240503
000004405	twx_timing_cover	97629	185736	3.358431	5.383996
000004350	twx_alt_support	97629	26800	10.242838	37.313825
000004462	twx_clutch_asm	1e+006	817958	0.679387	1.222557
000004456	twx_ac_compressi	1e+006	169803	0.811760	5.899171
000004414	twx_engine_skel	299516	410279	3.338725	2.437368
000004449	twx_ps_pump	1e+006	2e+006	0.805751	0.580300
000004484	twx_aux_drive_1	5e+006	8e+006	0.215547	0.129690
000004543	twx_water_bypass	51797	8034	19.306081	124.464677
000004525	twx_engine_body	3735	1408	267.719279	710.081899
000004483	twx_exhaust_man	7e+008	9e+008	0.001432	0.001130

Part Information
quantityInStock: 375
name: twx_flywheel
state: In Work
defaultUnit: each
number: 000004341
cost: 310
version: A.2 (Service)
Update Metrics

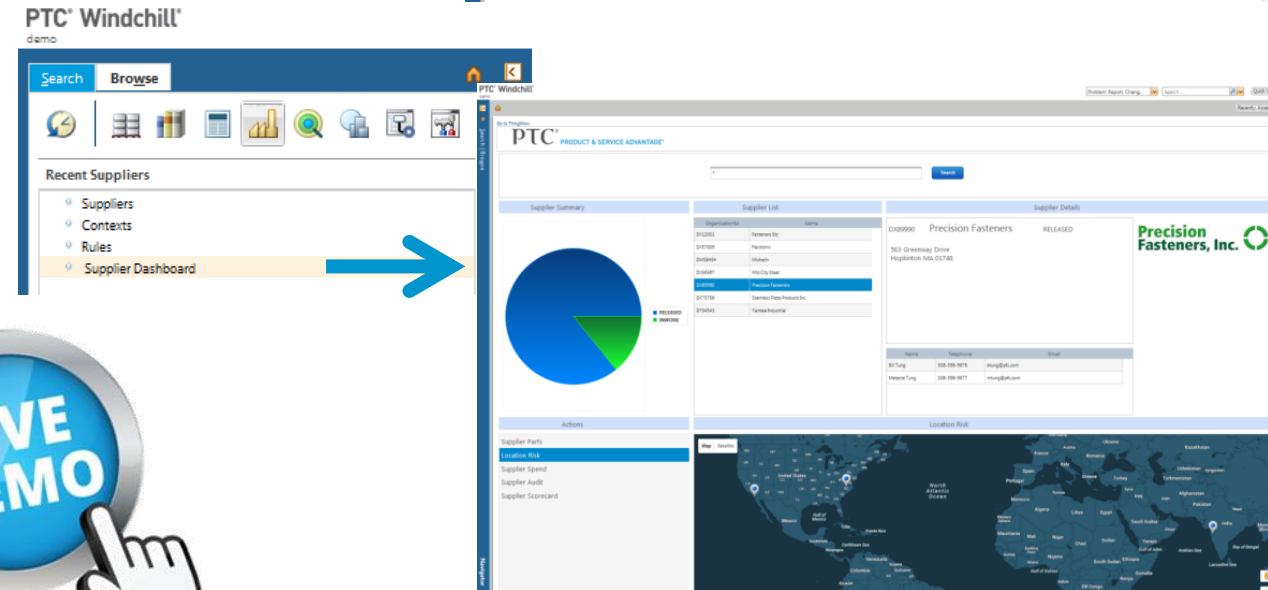
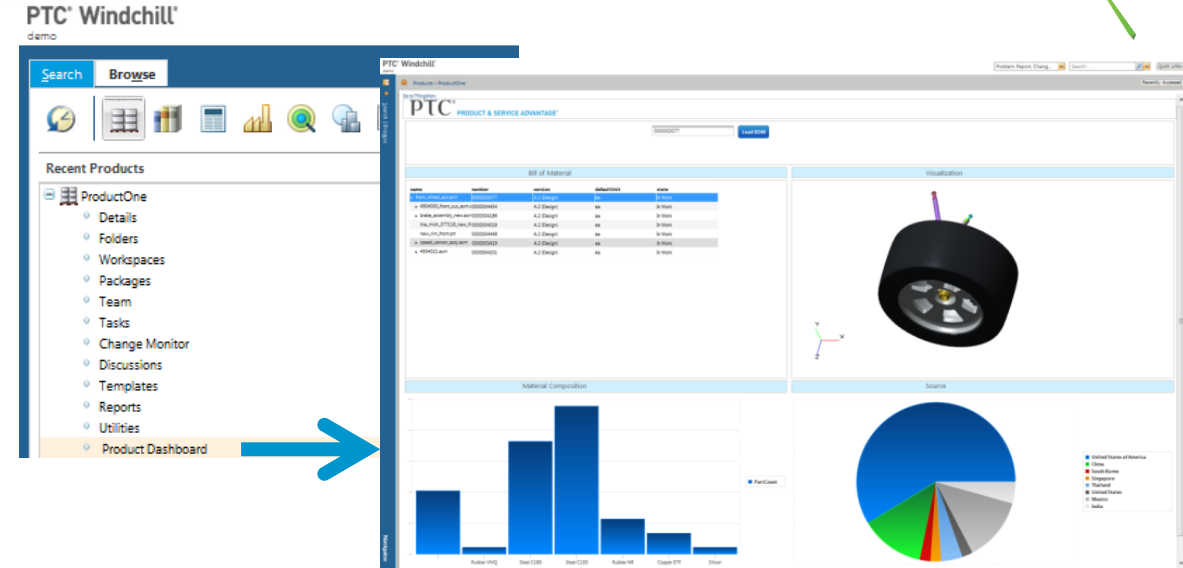
3D View
3D model of an engine.

Acetylene Pressure
Gauge: 15
Line graph showing pressure fluctuations from 2014-03-30 to 2014-04-29.
Issue Description: 0, 15, 32
Log FRACAS Incident

LEVERAGING THINGWORX MASH-UP IN WINDCHILL 11



- Windchill 11 UI allows embedded ThingWorx mashups
- Add actions calling ThingWorx mashup to :
 - Container navigation
 - Info page tabs
 - Home page tabs
- Supported via enhancements to Action and Action Model framework



PLM DASHBOARD USE CASE – CHANGE PROCESS

PTC Windchill
demo

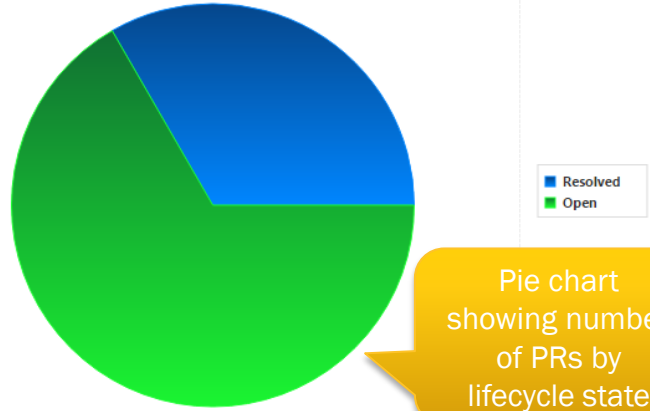
Problem Report, Chang... Search ... Quick Links

Products > ProductOne

Recently Accessed

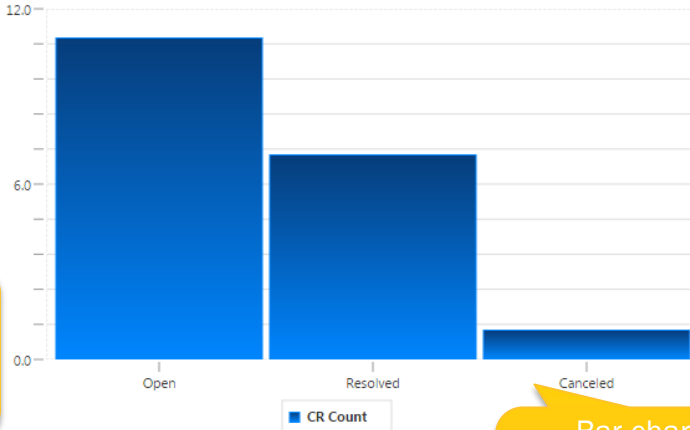
Go to ThingWorx

All Problem Reports



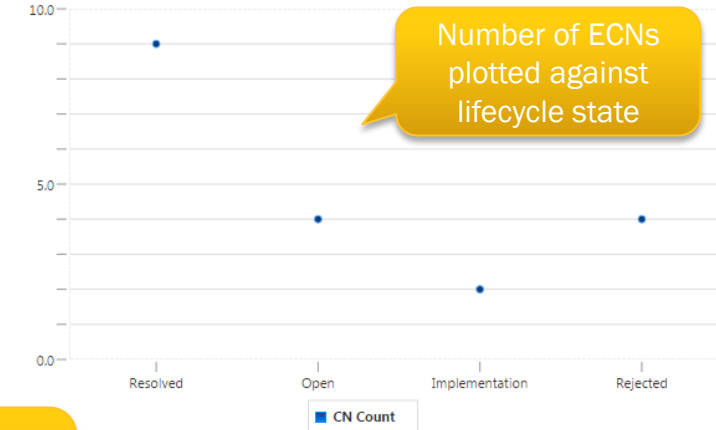
Pie chart showing number of PRs by lifecycle state

All Change Requests



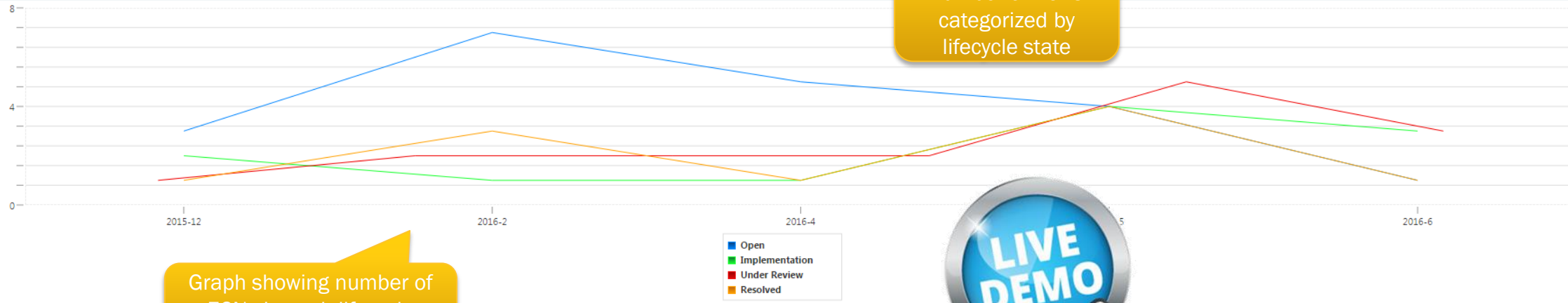
Bar chart of number of ECRs categorized by lifecycle state

All Change Notices



Number of ECNs plotted against lifecycle state

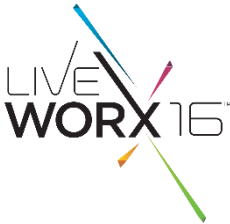
Change Notice History



Graph showing number of ECNs in each lifecycle state by month



PLM DASHBOARD USE CASES



1) List BOM from Windchill

name	number	defaultUnit	state
front_wheel_assembly	0000003077	A.2 (Design)	ea
speed_sensor_assembly	0000003419	A.2 (Design)	ea
4904000_front_usr_assembly	0000004454	A.2 (Design)	ea
new_rm_front_opt	0000004440	A.2 (Design)	ea
4904022_assembly	0000004201	A.2 (Design)	ea
brk_assembly_new	0000004010	A.2 (Design)	ea
brake_assembly_new	0000004010	A.2 (Design)	ea

2) Visualization from Windchill

3) Material Composition of the Selected Assembly from Windchill/WPA

Material	PartCount
Rubber VMQ	1
Steel C350	2
Steel C350	3
Rubber NR	1
Copper ETP	1
Silicon	1

4) Supplier Part Shipment Data from ERP (Inventory Management Systems)

Country	Count
United States of America	3
China	1
South Korea	1
Singapore	1
Thailand	1
United States	1
Mexico	1
India	1

Product Dashboard

1) List Suppliers from Windchill SUMA

Organization	Name
DI12001	Fasteners Inc
DI17009	Farmans
DI18464	Mohsin
DI18487	Mil City Steel
DI18990	Precision Fasteners
DI17518	Sainees Pata Products Inc
DI19453	Yankee Industrial

2) Aggregate Suppliers by their Qualification Status

Qualification Status	Count
RELEASED	3
INWORK	1

3) Supplier Information From Windchill SUMA

Precision Fasteners, Inc.

563 Greenway Drive
Hopkinton MA 01748

4) Supplier Part Ship From Locations from ERP Overlaid on a Location Risk Map

Supplier Dashboard

PLM DASHBOARD USE CASES



PTC® Navigate

Classification Search

Back


"FASTENER-WASHER" "Thickness" "> 1.0 m"

Parts List

Name	Number	Attributeinfo
CFASTENER-WASHER_9	CFASTENER-WASHER_9	2 m
CFASTENER-WASHER_1	CFASTENER-WASHER_1	2 m
CFASTENER-WASHER_4	CFASTENER-WASHER_4	2 m
CFASTENER-WASHER_10	CFASTENER-WASHER_10	2 m
CFASTENER-WASHER_5	CFASTENER-WASHER_5	2 m

Part Details :

Name	Value
Inside Diameter	
Catalog Page Number	
Length	
General Description	FASTENER_WASHER
Thread	



Classification Search

Classification Search

PTC® Navigate

Classification Report

Welcome Administrator


Back

start date: 2011-09-15 18:09:48

end date: 2013-10-06 18:09:48

Submit

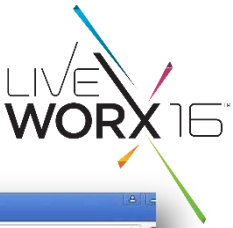
Classification Name	Number Of Parts
ASTENER-WASHER	10.00
CHOPSET	11.00
ASTENER-PLUNGER	5.00



Classification Report

Classification Part Report

PLM DASHBOARD USE CASES



NuWay Research - 8D Response Report

WHO IS EFFECTED BY THE PROBLEM?

Company: Briarwood Oncology Clinic	Date Opened: 11/16/2015	8D Number: CAPA-2 000000042
Address: 8455 S. Mulberry	Initial Response: By Phone	Customer Complaint No.: CC0001
Location: Ft. Collins CO.	Target Closed Date: 12/12/2016	
Part No./Code: 80524	Revision Date(s): 12/12/2015	
Product Name: Dialyzer	8D Initiator: David Wolf	
	8D Initiator's Spvr: Jeff Milkey	
<input checked="" type="checkbox"/> Internal OR <input type="checkbox"/> External	Actual Closed Date: TBD	

D1 Team Member Names/Titles:

Type	Name	Phone Number	Primary
	Denver Metro General	303-985-6411	no
	Brigham & Women's		no

D2 PROBLEM STATEMENT/DESCRIPTION (quantify) (one defect per 8D)

Material handling issues in pre-sterile packaging have resulted in numerous complaints from key customers. This issue needs to be investigated for root cause determination and then reviewed with management.

D3 Choose and Verify Intern Containment Action(s) (ICA):

Capa Investigation (D4)

Quality: Quality Division A
Type: CAPA Investigation Risk Assessment Required: No Yes

Number: 00021
Name: CAPA Investigation Name

Affected Objects:

Number	Name	Version	State	Modified Date	View Details
0000000017	ISO 13485 - QSP 7.5 Production and Service Provision	A	INWORK	2015-08-07 14:19:07 EDT	View
0000000056	Dialyzer	A	RELEASED	2015-10-06 18:24:52 EDT	View

Risk Assessment:

Required Yes/No: No Yes

Select or Change Assessment

Assessment Code	Assessment Description
RA-SIF1D0R4	null

Risk Assessment Information:

PTC PRODUCT & SERVICE ADVANTAGE

Final Complaint Mashup

Service Issues

Issues by Category

Issue #	Issue Description	Complaint #	Issue Number	Primary Product
T-250100	Possible Damage to Human	C-250100	(02) 00623456	ECG Management System
T-250998	Possible Damage to Equipment	(02) 004234567890	(02) 004234567890	Serial Number: 42345678
T-250897	Loss of RAD Controller	(02) 003234567890	(02) 003234567890	Issue Description: Product Malfunction
T-250101	Leaking	C-250101	(02) 00723456	Unique Device Identifier: (02) 004234567890 (02) 200101 (20) 42
T-250103	Inaccurate Delivery	(02) 00923456	(02) 00923456	Event Date: 2015-02-26 00:00:00
T-250099	Functional Failure	(02) 00523456	(02) 00523456	Event Location: New West Physicians
T-250895	Failure to prime	C-250895	(02) 003234567890	Event Country: USA
T-250282	Degraded Video Display	(02) 008234567890	(02) 008234567890	Origin Country: USA
T-250896	Battery Overheating	(02) 002234567890	(02) 002234567890	Service Engineer: Simon Garfunkel

Complaints

Number	Name	CountryOfOccurrence	CountryOfOrigin	EventCode	EventCodeP
C-250280	Possible Damage to Human	USA	DEU		
C-250895	Failure to prime	USA	USA		
C-250101	Leaking	USA	DEU		
D-15189	Damage to front panel	USA	USA		
D-15182	Broken plastic casing around control panel	USA	USA		
89022	C-1	USA	USA		
D-15181	Loose lead	USA	USA		
D-15184	Noise complaint	USA	USA		

Complaints Summary:

FDA	1	Health Canada	0
MHRA	0	厚生労働省	0
Health Canada	0	Health Canada	0

8D CAPA and SCAR Role Based App

Connected Service and Complaint App

Light Touch Infrequent Users
Access CAPA or SCAR

Aggregate info from ServiceMax, Salesforce CRM
Connected device and Windchill CEM

PLM DASHBOARD USE CASES



1) List Service Issues from CRM or Service Apps

Issue #	Issue Description	Category
T-250200	Early In...	
T-250201	Protective coating... green is scratched	
T-250095	Failure to prime	C-250095
T-250096	Battery Overheating	
T-250097	Loss of RAID Controller	
T-250098	Possible Damage to Equipment	C-250098
T-250099	Functional Failure	
T-250100	Possible Damage to Human	C-250100
T-250101	Leaking	C-250101
T-250102	Degraded Video Display	

2) Aggregate Issue Information

3) Capture Service Issue Information in a CEM Complaint Intake Form

4) Create CEM Complaint in Windchill

Number	Name	CountryOfOccurrence	CountryOfOrigin	EventCode	Event
C-250100	Possible Damage to Human	USA	DEU		
C-250095	Failure to prime	USA	USA		
C-250101	Leaking	USA	DEU		
		USA	USA		
	control panel	USA	USA		
		USA	USA		
D-15101	Loose lead	USA	USA		

5) Monitor Open Regulatory Reporting Requests

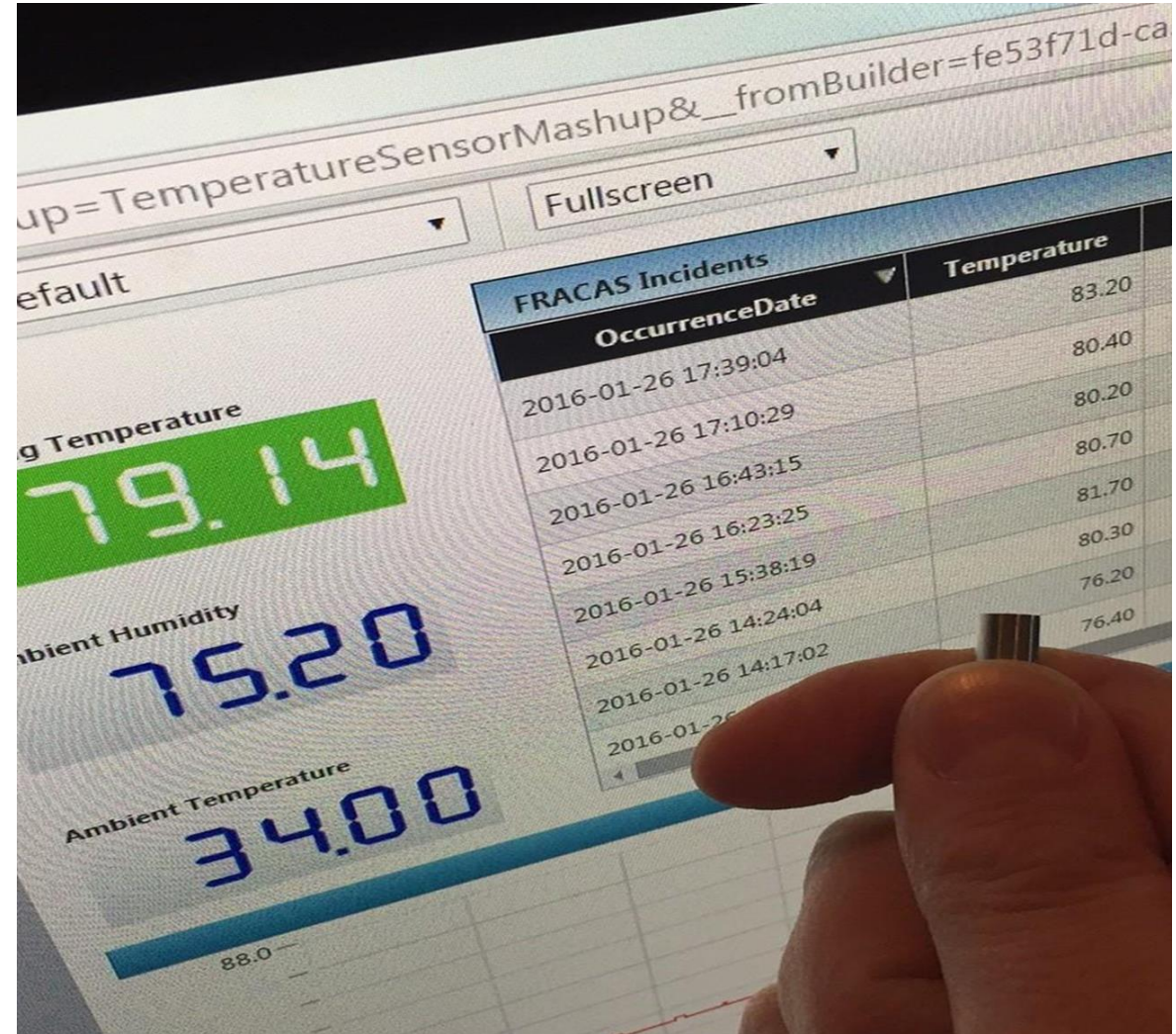
Regulatory Body	Open Requests
FDA	1
MHRA	0
Health Canada	0
Santé Canada	0

Connected Service and Complaint App

CONNECTED FRACAS USE CASE



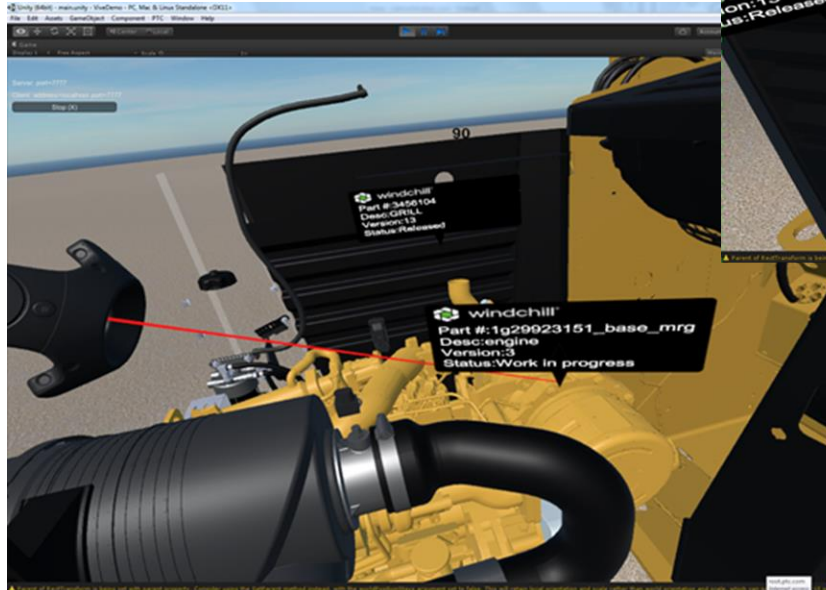
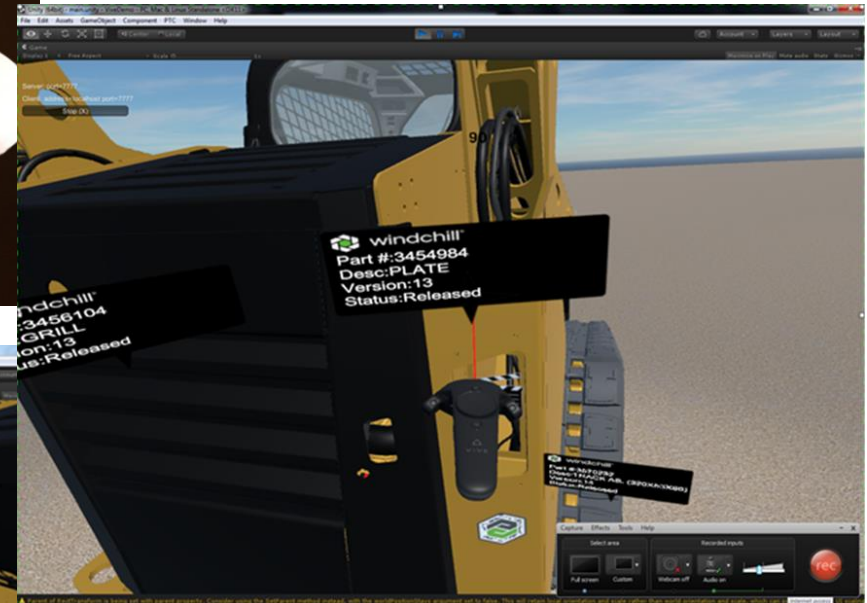
- Collection of Failure from a Connected Device
 - FRACAS Incident automatically generated in Windchill Quality Solution
 - Automatic capture of sensor data for evidence
- Integration with Enterprise systems
 - Initiate Corrective action in PLM
- Mash-up with history of operating conditions
 - Mobile Device browser
 - Augmented Reality data display



AUGMENTED REALITY USE CASE



VIRTUAL REALITY USE CASE



The image features several colorful geometric shapes, including triangles and lines in shades of blue, green, yellow, and purple, scattered across the background. A large, multi-colored geometric shape is prominent on the right side. The text 'LIVE WORX 16' is centered, with 'LIVE' in a thin, outlined font and 'WORX 16' in a bold, solid black font. A small 'TM' trademark symbol is positioned to the right of the '16'.

LIVE
WORX 16™

TAKE A FRESH LOOK AT THINGS

liveworx.com