FIOP Modeling Overview

Siemens Government Technologies, Inc.

SIEMENS GOVERNMENT TECHNOLOGIES

COMFRC's FIOP Program

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Fleet Readiness Centers

Mission

The Navy's Fleet Readiness Centers (FRCs), conduct maintenance, repair, and overhaul of U.S. Navy aircraft, engines, components and support equipment.

Headquarters

Commander, Fleet Readiness Centers (COMFRC) – NAS Patuxent River, MD

Three Major Depot Locations

- FRC Southwest – NAS North Island, CA
- FRC Southeast – NAS Jacksonville, FL
- FRC East – MCAS Cherry Point, NC

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FIOP Modeling Program Overview

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High Level Program Overview

Purpose

- Build simulation models of the FRCs, and through experimentation and analysis, proposed optimizations for improving FRC repair work.

Deliverables

- Digital Modeling Tool (PlantSim with custom WebUI)
- “As-is” Enterprise model of all three FRCs
- “To-be” Enterprise model of all three FRCs
- Model Experimentation and Analysis
- Training

A digital model of a production system is based on historical data, routing information, and subject matter experts' input. Complex production environments can be analyzed and optimized. Simulations also provides the ability to build out and test future state scenarios to influence investment decisions

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PlantSim

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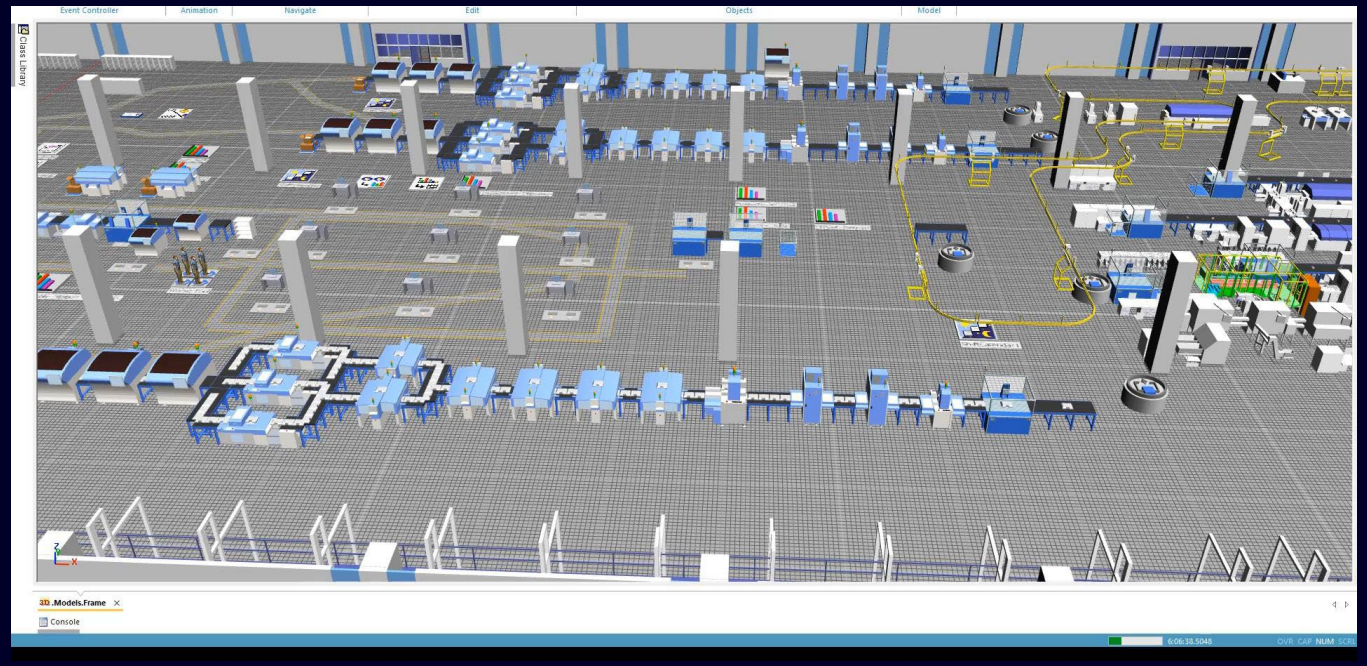
Plant Simulation: What is Plant Sim?



- Allows for manufacturing facilities to build a digital twin to represent the shop floor and manufacturing processes

- Enables the simulation, visualization, analysis and optimization of production systems and logistics processes.

- Flexible and robust, providing manufacturing modeling of several types of industries

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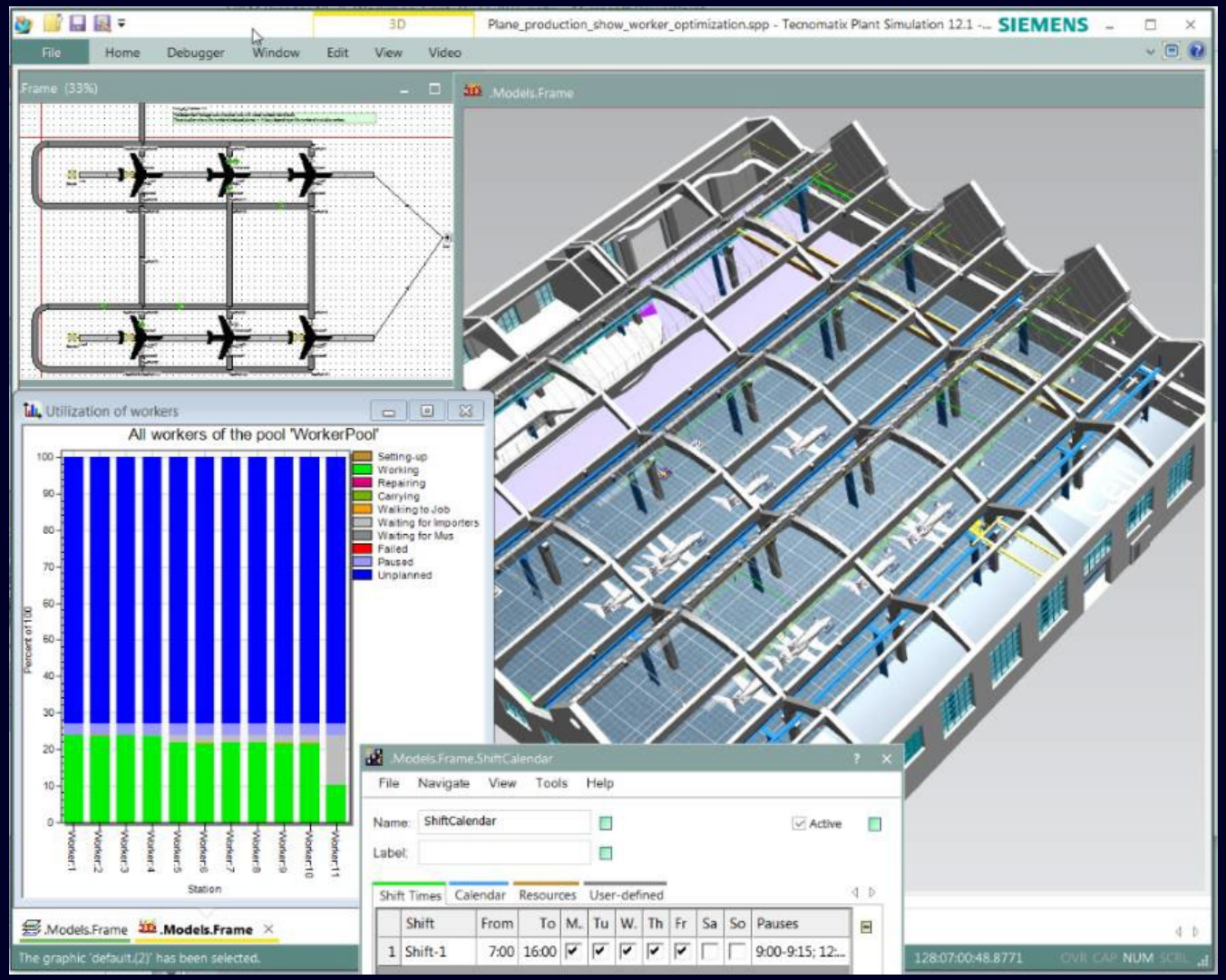
Plant Simulation: Overview

- Modeling can take place at a plant, line, building, or even machine level.
- Analysis on behavior of facility, such as throughput, utilization, and capacity studies.
- Production “what if scenarios” and optimization.



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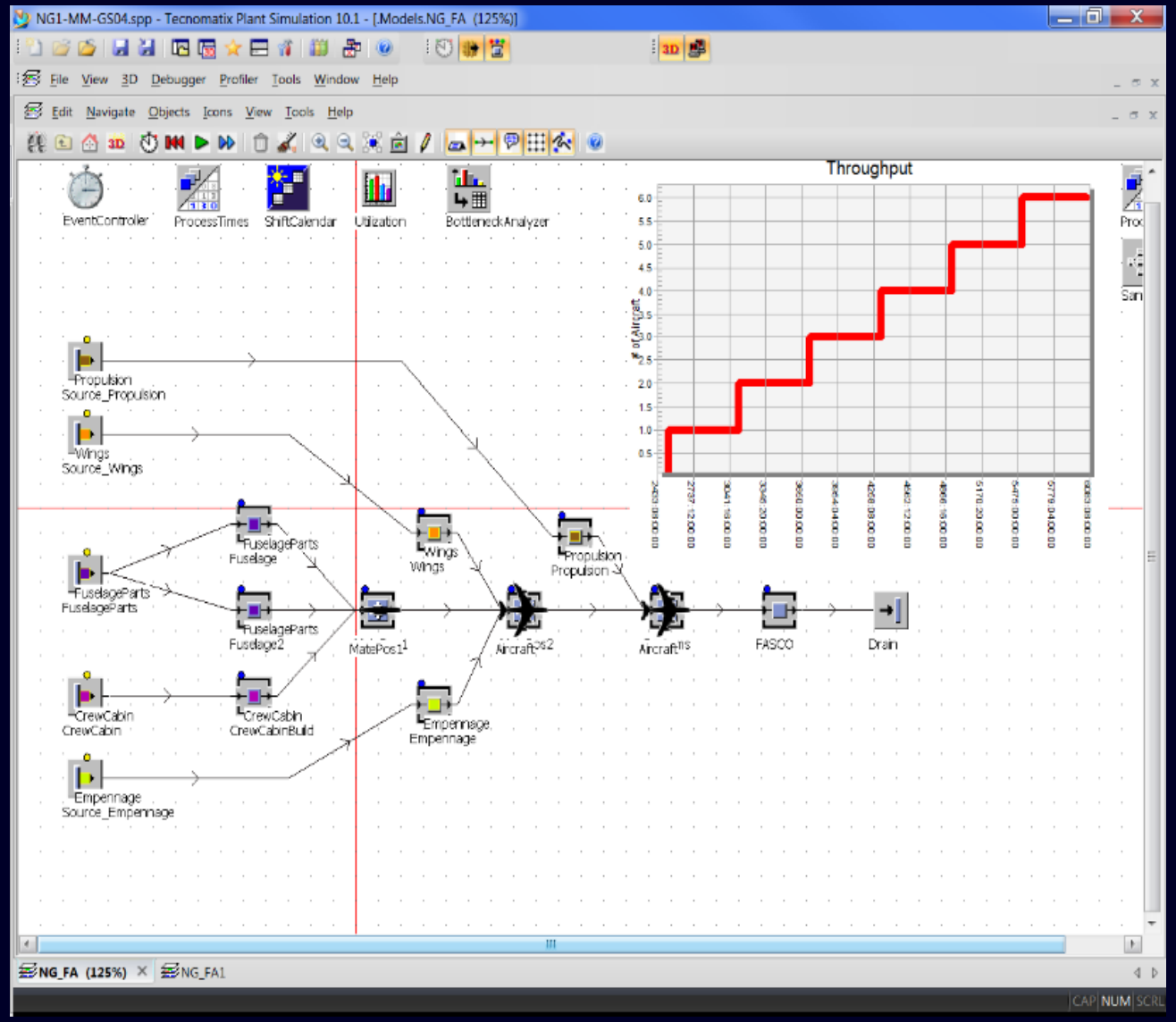
Plant Simulation: Benefits



- Improved productivity of existing facilities
- Reduced investment in planning of new facilities
- Reduced inventory and throughput time
- Lowered investment risks through early proof of concept.

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Model Capabilities and User Interface

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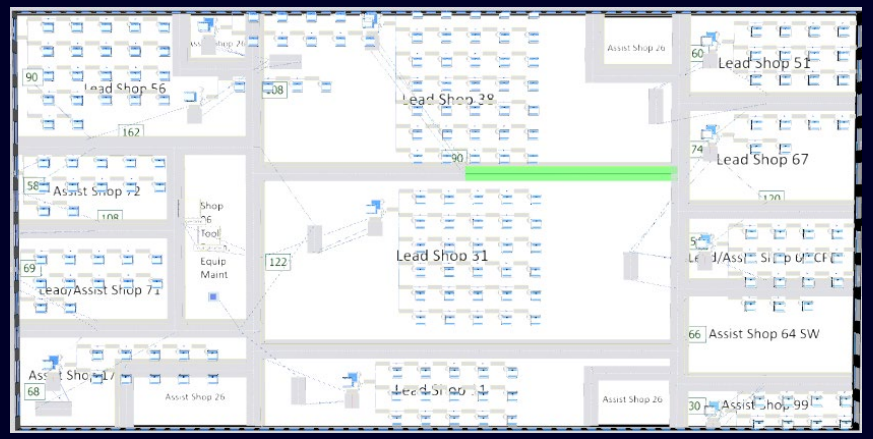
Current Model Capabilities

The model is primarily data-driven and a unique model configured state is used to create experiments as follows:

Physical Configuration

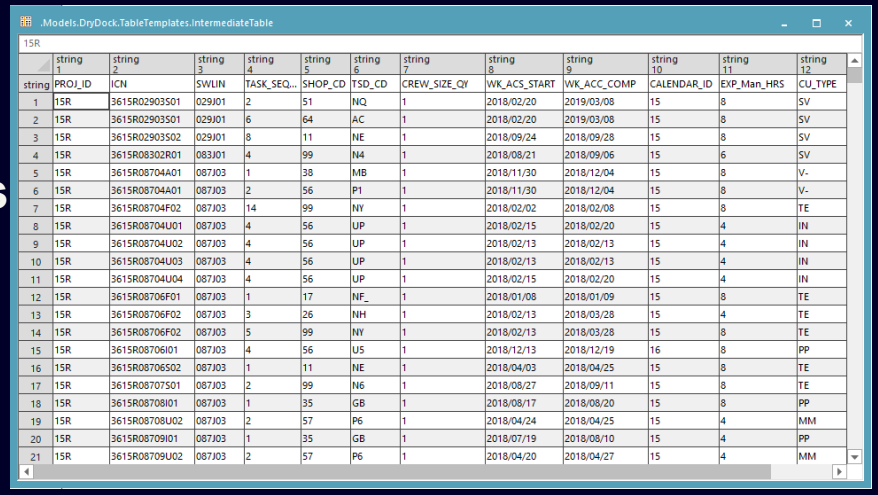
Change the layout of the As-is model

Examples:
- Add/Remove buildings/facilities
- Relocate working areas in different buildings
- Define new transportation systems/paths
- Change transportation paths



2D visualization
Heatmap – Parts Movement
Heatmap – WIP/Bottleneck Analysis
Web User Interface (WebUI)
Worker Utilization

- **Gantt Charts**
- **Equipment Utilization**
- **Time in System**
- **Custom Charts, reports and tables**
- **Out of the box collected data/statistics**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Data Configuration

Consist of changing data, logic and variables that will have an impact in the simulation results

Examples:
- Modify TSD assignments and locations
- Modify shifts and available personnel
- Modify MTBF/MTTR

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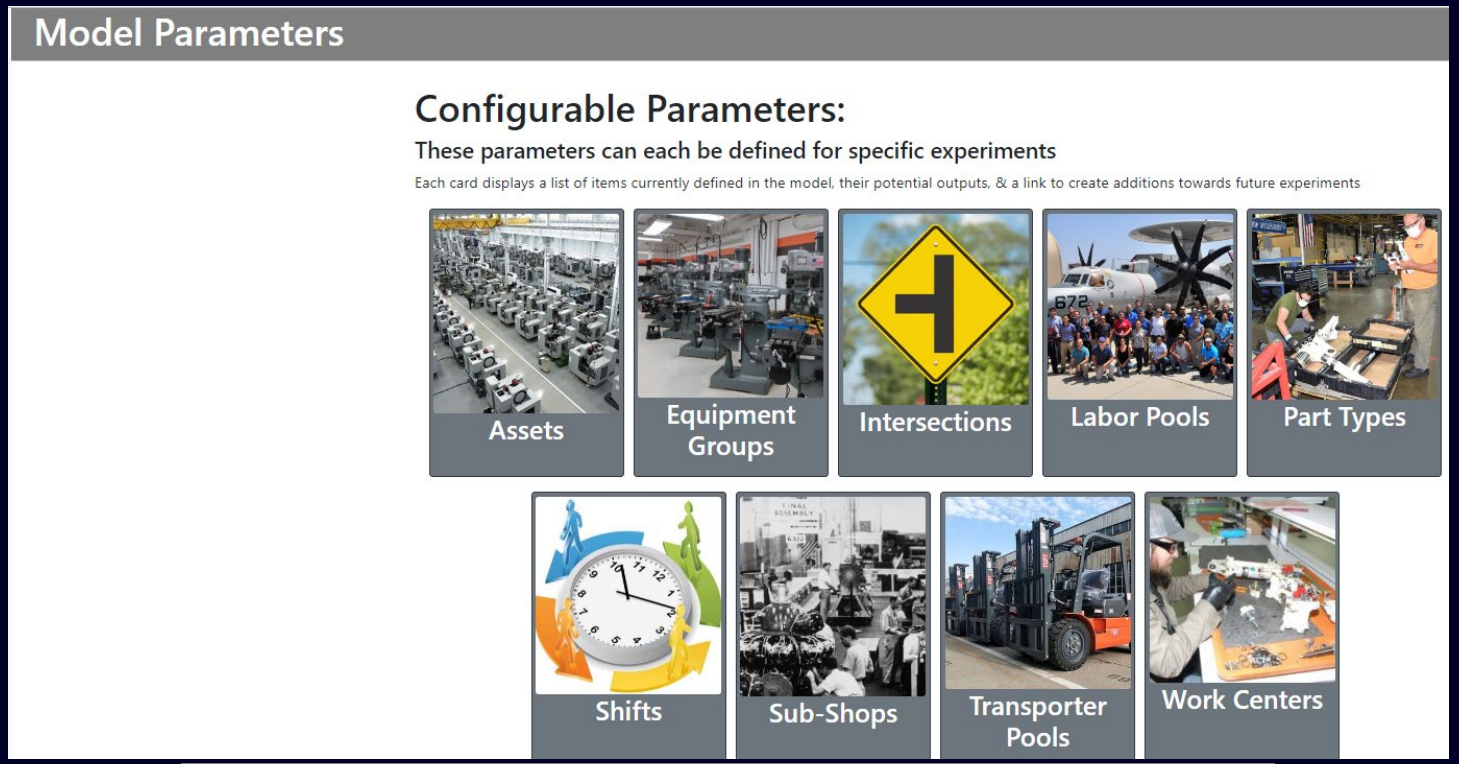
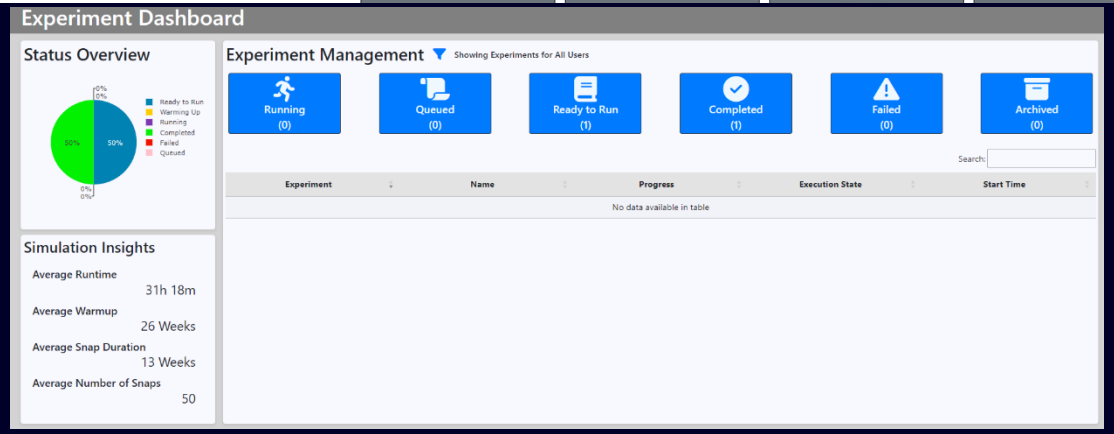
Web User Interface (WebUI)

WebUI allows for the running of the simulation model under various scenarios to test the effect on a given variable.

The user will define the Input Variables, and define the Experiments to be tested.

The user will also define how many observations per experiment and the Experiment Manager takes the average of the observations.





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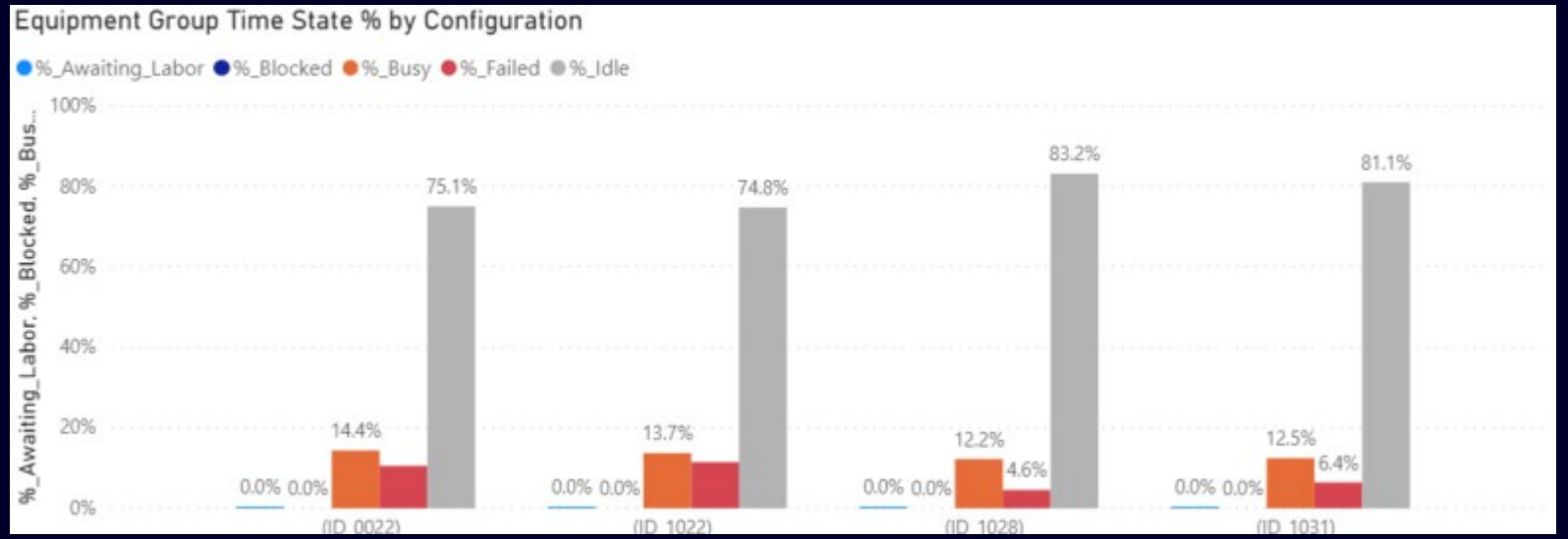
Equipment Utilization



- Equipment is modeled and adjustable within the model down to the specific asset
- The Equipment Chart shows the statistics and utilization of operators or equipment modeled in the simulation
- This data can be filtered by asset, workcenter or shop for further analysis.

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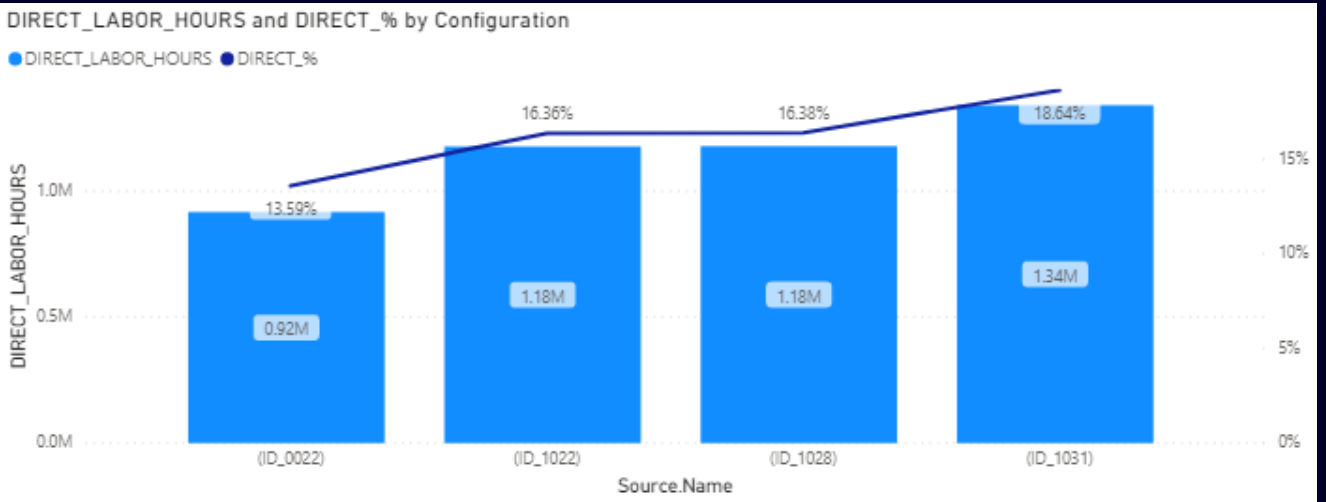
Resource Utilization



Source.Name	Model_ Quantity	DIRECT_LABOR _HOURS	INDIRECT_LABOR _HOURS	TOTAL_LABOR _HOURS	DIRECT_%	INDIRECT_%
(ID_0022)	321	916,461	5,825,393	6,741,854	13.59%	86.41%
(ID_1022)	349	1,176,295	6,012,109	7,188,404	16.36%	83.64%
(ID_1028)	349	1,177,767	6,010,637	7,188,404	16.38%	83.62%
(ID_1031)	349	1,340,175	5,848,230	7,188,404	18.64%	81.36%

- Resources are modeled and adjustable within the model, including certification or specific skillsets (TSDs) required to perform operations (i.e. welding)
- The Resource Chart shows the statistics and utilization of operators or equipment modeled in the simulation
- This chart can sort operators by pool, classes, and individuals for further analysis.

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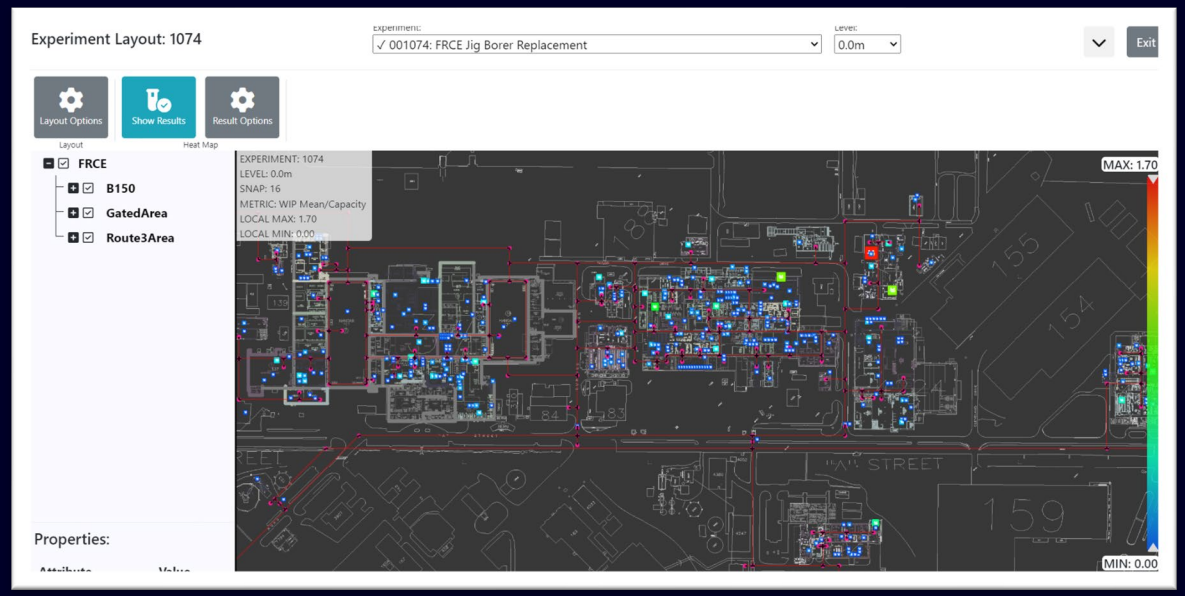
Bottleneck Analyzer/Heat Map

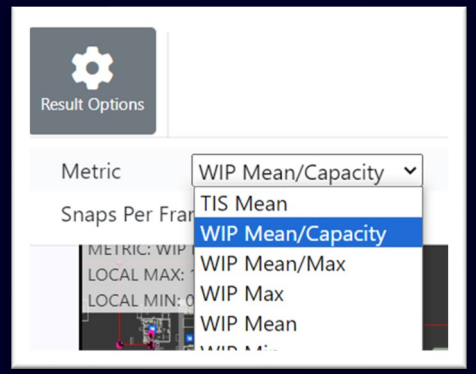
- The heat map is used to easily see the flow and the number of times a part moves to particular work centers. This tool is used to identify the areas of the facility where most of the product and manufacturing activities are taking place

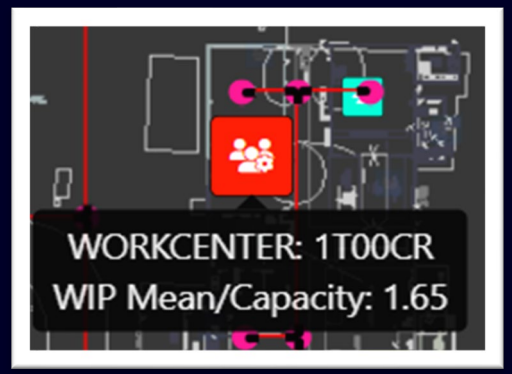
- The Bottleneck Analyzer is a tool to allow for the identification of potential bottlenecks within a manufacturing facility.

- Provide visual indicators as well as statistical reports.

- Indicates areas of the facility where additional analysis and running “what if” scenarios will be beneficial in the identification of long-term optimization







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FIOP Model Experimentation

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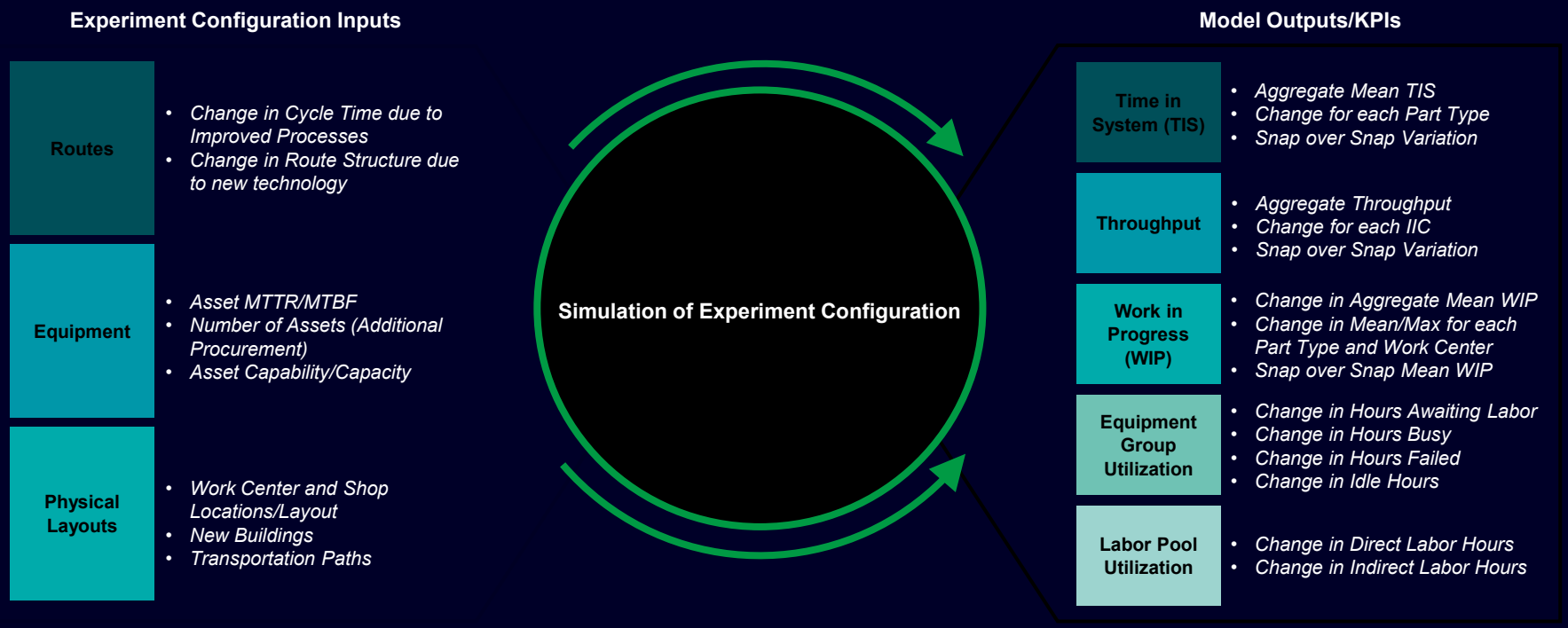
FIOP Model Experiment Overview



- Details of each physical scenario are the main levers that define the configuration inputs for experiments
- Experiment KPIs are compared across experiments and the resulting analysis is used to support the development of the FRCs business case

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To-be Experiment Examples

The As-is model may also offer valuable alternatives for To-be experiments, here we list some examples:

- Evaluation of the capacity of the work areas (TSDs)
- Impact of introducing new technology, time reduction of groups of tasks
- Replacement of aging equipment
- Improvement of MTTR/MTBF
- Impact of modifying the labor pool for certain activities
- Impact of moving or relocating work areas into new buildings/shops
- Impact of reducing specific delays

Model is currently being used to to show the impact of new and renovated facilities at all three FRCs

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Experiment Results Example
Model used to evaluate the consolidation of landing gear workload

FLEET READINESS CENTERS (FRC) · INFRASTRUCTURE OPTIMIZATION / MODERNIZATION PLAN

Center of Excellence: fixed wing landing gear

2x Increased Throughput with the Same Turnaround Time

Through consolidation and optimization, this plan **maximized FRC Enterprise efficiencies**.

18%

Reduction in Overall Move Hours

Streamlining the landing gear workload into a single FRC Center of Excellence, versus spreading it across four buildings and two sites, leads to a significant reduction in move hours and an increase in overall efficiency.