Assembly Planner

Technology to Improve the Speed, Quality, and Cost of Engineering and Operations in Assembly Factories
• Innovative Manufacturing Process Management (MPM) Solutions
  • Formed in 2002 in the United States
  • Branched off from EDS PLM Solutions
  • Iowa State University Research Park
  • Focus on engineering software solutions to overcome complex manufacturing difficulties (improving quality, cost, and delivery).

• Supported by highly educated and experienced engineers and software developers.

• President: Dr. Dave Sly
  • BSIE, MSIE, MBA, PhD IE, Licensed PE
  • Iowa State University - Professor of Practice

• Biggest competitor is MS Excel.
  Biggest challenge is resistance to change.
Assembly Planner Overview
The Value of Assembly Planner
Process Planning and Work Instructions
Integrated Industrial Engineering Functions
Integrated Manufacturing Engineering Functions
Integrated Logistics Functions
Summary & Next Steps
Product Design
Mechanical and Electrical Engineering
When

What

Product

Manufacturing Execution
Planning, Purchasing, Operations

ERP

Product Design
Mechanical and Electrical Engineering

PDM
When Manufacturing Execution Planning, Purchasing, Operations

What Product Design Mechanical and Electrical Engineering

How Manufacturing Design Process and Industrial Engineering

When Manufacturing Execution Planning, Purchasing, Operations

ERP
What

Product

PDM

Product Design
Mechanical and Electrical Engineering

How

Assembly Planner

assembly process data & integrated tools

Process

Manufacturing Design
Process and Industrial Engineering

When

ERP

Manufacturing Execution
Planning, Purchasing, Operations
• Assembly Planner is a Manufacturing Process Management (MPM) system for manufacturing design and planning; which is not a core competency of MRP II / ERP systems.

• Process and industrial engineers manage the official manufacturing process data in one central database (versus a variety of Excel and Word files in a variety of locations), and re-use that data for complex and interconnected functions like process planning, time & motion study, assembly line balancing, and work instructions.
• Some customers use Assembly Planner for (1) automated work instruction reports, and (2) the benefits of having single source of data.
• Some customers use Assembly Planner for (1) integrated time & motion study and assembly line balancing, as well as (2) the benefits of having single source of data.
• Most customers use Assembly Planner for all of these functions …and more.

Assembly Planner
Sample Customer Use

Assembly Planner System
(central source of process data & integrated tools)
Assembly Planner
Optional BOM Management

- Assembly Planner can store engineering BOMs and manage manufacturing BOMs.
Assembly Planner System

(central source of process data & integrated tools)

• Automated data exchanges enable consistency between PDM, AP, and ERP systems; electronically bridging the gap between PDM and ERP (a common goal for IT executives).

• Common PDM interfaces include Autodesk Vault, CATIA, and eMatrix. Common ERP / MRP II interfaces include SAP, Oracle Fusion, JD Edwards, Teamcenter Manufacturing, and MAPICS.
- The Engineering Change Management module uniquely offers one system that electronically connects engineering BOMs & Item Master details with manufacturing BOMs, and related process data.

- Frequently, the number of parts in a product’s work instructions do not equal the number of parts in its manufacturing Bill of Materials. Consumption Workbench compares process consumption with an mBOM to highlight and resolve mismatches between the two.
The In-Plant Logistics Management system includes a Plan for Every Part (PFEP) database, an eKanban system, and an eKitting system.

When engineering changes are processed or line balance changes occur, part plans need to change as well. If directly linked to assembly process data, part plan information can stay in sync.
Assembly Planner Overview

The Value of Assembly Planner

Process Planning and Work Instructions

Integrated Industrial Engineering Functions

Integrated Process Engineering Functions

Integrated Logistics Functions

Summary & Next Steps
**Assembly Planner**

**Process of Designing Assembly Lines**

- List of steps used by engineers to design and plan assembly line operations (international automotive manufacturer).

- Same procedures apply to most industries involved in mass production.

- These engineering tasks drive time to market, and assembly line performance.

- Current State: Separate data & systems, limited integration of production process data, time consuming Non Value Added (NVA) tasks, limited time for engineering analysis and improvement.

- Applies to New Product Introductions, Engineering Changes, New Factories, and Outsourcing.
<table>
<thead>
<tr>
<th>Step</th>
<th>Activities Performed in Process &amp; Industrial Engineering with Assembly Planner from Proplanner</th>
<th>Systems Used</th>
<th>Who Does it?</th>
<th>Who should do it?</th>
<th>Hours/ Month</th>
<th>Cost/ Month</th>
<th>Comments</th>
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<tbody>
<tr>
<td>1</td>
<td>Receive Electronic BOM from PDM System</td>
<td>Electronic file and printed</td>
<td>Mfg / IE</td>
<td>Mfg / IE</td>
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<td>2</td>
<td>Write all work elements in the list of work</td>
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<td>Mfg</td>
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<td>Develop assembly line balance model</td>
<td>Line Balance stand-alone</td>
<td>IE</td>
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<td>Manual cut &amp; paste Time Study standards into work elements</td>
<td>Line Balance stand-alone</td>
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<td>Generate parts list with details</td>
<td>MS Excel</td>
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<td>Prepare line balance for wall posting</td>
<td>Wood Board</td>
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<td>UPDATE ALL SYSTEMS</td>
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<td>MS Excel Pillar/Hill Charts</td>
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<td>Again update tech operating procedure documents</td>
<td>Macro</td>
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## Assembly Planner

### Streamlined Process of Designing Assembly Lines

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<td>1</td>
<td>Assign a work station to each work element</td>
<td>MS Excel</td>
<td>IE</td>
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<td>AUTOMATIC workstation assignment almost 100% of development time reduced</td>
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<tr>
<td>2</td>
<td>Create performance reports</td>
<td>Line Balance stand-alone, MS Excel pillar/hill charts, various other systems</td>
<td>IE</td>
<td>IE</td>
<td>All in one report, elimination of all other systems needed</td>
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<td>Develop job instruction sheets</td>
<td>MS Excel</td>
<td>IE</td>
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<td>AUTOMATIC work instructions 100% of development time reduced</td>
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<td>Develop more technical operating procedure documents</td>
<td>MS Excel</td>
<td>IE</td>
<td>Operations</td>
<td>AUTOMATIC job detail sheets 100% of development time reduced</td>
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<td>5</td>
<td>UPDATE ALL SYSTEMS</td>
<td>Ergonomics stand-alone, Job Instruction Sheets, Tech Operating Procedure Documents</td>
<td>Manually</td>
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<td>Automated</td>
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### Automated Steps

- Ergonomics stand-alone
- Job Instruction Sheets
- Tech Operating Procedure Documents
## Assembly Planner

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<td>Assign tools with specs to each work element</td>
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<td>Mfg / IE</td>
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<td>Generate layout &amp; evaluate material flow</td>
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<td>IE</td>
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<td>Evaluate work station design</td>
<td>MS Excel, AutoCAD</td>
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<td>Evaluate changes to pillar/hill line balance charts</td>
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<td>Process Improvement</td>
<td>Post Its, white board, MS Excel, etc.</td>
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<td>Generate Change agreement spreadsheet</td>
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<td>UPDATE ALL SYSTEMS</td>
<td>Workstation layout changes (part delivery locations)</td>
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<td>Layout / Material Flow</td>
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# Assembly Planner

Streamlined Process of Designing Assembly Lines

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<tr>
<th>Step</th>
<th>Activity Performed Preceding Activity</th>
<th>System Used</th>
<th>Who Does It?</th>
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**CURRENT STATE**

**FUTURE STATE**
## Assembly Planner

### Streamlined Process of Designing Assembly Lines

#### CURRENT STATE

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#### FUTURE STATE

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</table>

**Faster engineering functions**

**Improved engineering results**

**More efficient operations**
Assembly Planner
New Product Introduction

Typical NPI
Assembly Planner
Improved New Product Introduction

Units Produced

Month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Typical NPI  Faster NPI - Additional Units
By having a single source of process data, integrated with automated tools, engineers design & make changes to production processes much faster.
• How many different file formats, systems, locations do you have for your various process data (e.g. – Excel, Word, Access - for BOMs, time studies, line balancing, work instructions, etc.)?
Assembly Planner
Issues that Affect Maximum Factory Efficiency

• How many different file formats, systems, locations do you have for your various process data (e.g. – Excel, Word, Access - for BOMs, time studies, line balancing, work instructions, etc.)?

• What are the annual costs of locating and maintaining data in these disparate files, systems, and departments?
How many different file formats, systems, locations do you have for your various process data (e.g. – Excel, Word, Access - for BOMs, time studies, line balancing, work instructions, etc.)?

What are the annual costs of locating and maintaining data in these disparate files, systems, and departments?

What are the production cost, quality, and output impacts each year due to process data not being accurate and up to date?
Assembly Planner
Issues that Affect Maximum Factory Efficiency

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Assembly Planner
Issues that Affect Maximum Factory Efficiency

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• How often do you re-balance your lines? Do you have the operators on the line where you need them, when you need them?
Assembly Planner
What We Provide

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Assembly lines re-balanced and optimized in hours, with automated reports and charts. Reduced direct labor costs from minimizing operator idle time on the line.
Assembly Planner
What We Provide

- Secure source of integrated process data; managed in one central, sharable location.
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- Improved production quality, cost, and output from accurate and up to date engineering data.
- Improved engineering quality, cost, and output from re-use of process data and advanced, integrated engineering tools.
- Assembly lines re-balanced and optimized in hours versus weeks, with automated reports and charts. Reduced direct labor costs from minimizing operator idle time on the line.

Companies can utilize any, or all, of the Assembly Planner modules.

Each module can work independently, or integrated with others.
Assembly Planner Overview

The Value of Assembly Planner

**Process Planning and Work Instructions**

Integrated Industrial Engineering Functions

Integrated Manufacturing Engineering Functions

Summary & Next Steps
• Create a new Assembly Line (Routing).
• Existing Routings in the database can be re-used as a starting point for a new Routing.
• Define the list of Operations used in the assembly process (group of all work done at Station).
• Users can easily create Custom Data Fields, to meet their specific needs.
• Import mass amounts of data via file import, or copy/paste from MS Excel.
• Easy to edit large amounts of data in the spreadsheet interface.
• Define the list of all possible work Activities at each Operation.

• Activities are the smallest units of work that can be transferred between stations during line balancing.

• You can define new Activities, or re-use existing Activities from the database.

• Organizing process data into Routings/Operations/Activities matches with ERP systems, which allows for easy data exchange between database systems.

• Each view is customizable.
Here at the Activity level of detail, we define information related to each specific task (properties of each Activity).

We also define the relationships of the Activity with other entities in the database.

The amount of data associated with an Activity is determined by each customer.

Also at the Activity Level, we can perform video time studies, MTM, BasicMOST, MODAPTS studies, and ergonomics analysis.
• Videos can be associated with each work Activity.
• Videos are re-used in time studies, line balancing, and shop floor work instructions.
• Video time studies are much more accurate than stopwatch studies.

• Multiple pictures can be associated with each work Activity.
• Pictures are re-used in line balancing and work instructions.
• Built-in image editor.

• Any document type can be associated as well; commonly used in Shop Floor work instructions.
Assembly Planner
Process Planning – Activity Work Steps

- Work Steps are more detailed descriptions of the work being performed within each Activity.
- This allows us to create a more detailed summary of the Activity, and meet the specific work instruction requirements of each customer.

- Work Steps are re-used in time studies and work instructions.
- The data is automatically pulled from the database into custom, or standard, work instruction template.
- This view is customizable.
A list of available tools is defined in the Resource library.

At the Activity level, we document the tools required to perform each Activity.

The tool data is re-used in the automated work instruction reports. Engineers can search to see which processes use a specific tool.

After line balancing, we can run a report that shows the required tools at each station.

No limit to the number of tools stored in the database.
A list of available parts & assemblies is defined in the Component library.

At the Activity level, we associate the parts required to perform each Activity (consumption).

The consumption data is re-used in engineering changes, the consumption workbench tool, and work instructions.

After line balancing, we can run a report that defines the required parts at each station.

No limit to the number of parts mapped to each Activity.
• Define the specific product models and options that use each work Activity.

• The model and option data allows us to quickly calculate task times and take rates to ensure accurate mixed model line balancing.

• Additionally, this model and option data allows us to automatically generate unit specific work instructions in both printed and electronic formats.

• Part requirement reports can be generated based on the actual production schedule.
The process data is managed in the Assembly Planner system, and then the data is automatically pulled from the database into a customized, or standard, template.

Work Instructions can be created in seconds by running the automated Work Instruction reports.

Any data associated with an Activity can be automatically used in the Work Instructions (also, CAD, PDF, etc. files can be displayed in shop floor work instructions).

Eliminate wasted engineering time spent updating & formatting work instructions.
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• Eliminate wasted engineering time spent updating & formatting work instructions.
Optionally, customers can choose to electronically deliver work instructions to the factory floor.

Work instructions are automatically generated specific to each product being assembled (dynamically changed based on each unit’s product model / option mix).

Any data or documents associated with each Activity can be delivered directly to the operators (re-use of data).

Operators can create change requests, and alert management to issues (two way communication between engineers and operators).
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• Assembly Planner Overview
• The Value of Assembly Planner
• Process Planning and Work Instructions
• Integrated Industrial Engineering Functions
• Integrated Manufacturing Engineering Functions
• Integrated Logistics Functions
• Summary & Next Steps
In the same system, we can perform video time studies on the official work Activities.

One set of data, versus many different files owned by different engineers in different departments.

Engineers can define estimated times, perform video time studies, and/or MTM, MOST, as well as MODAPTS motion studies.

Additionally, detailed Lean VA/NVA analysis capabilities exist to eliminate waste. Ergonomics analysis also available.

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Automated reports included.
Assembly Planner

Assembly Line Balancing – Precedence Relationships

• Because we have the work activities and process times in Assembly Planner, we can perform automated & manual assembly line balancing.

• It is very useful to define the precedence relationships between the activities on the assembly line/routing, before auto-balancing (single or mixed model lines).

• Assembly Planner uses variations of the COMSOAL algorithm, modified by PhD level engineers.

• Automatic Yamazumi charts re-use activity data. Automated reports included.
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Optionally, engineers can combine the assembly line balance scenario with the actual customer orders, to analyze the planned sequence of products entering the line.

This Sequence Planning analysis tool tells engineers and supervisors which stations will go over takt time (as well as when, and for which units).

Supervisors can use this tool to re-sequence the line, to reduce effects on stations at risk.

Alternatively, supervisors could choose to not re-sequence the line, but send additional labor to the at risk stations.
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Assembly Planner
Engineering Change Management

- Uniquely offers one system that electronically connects eBOMs & Item Master details with mBOMs, and related process data.

- Streamlines the Engineering Change process from ECR to ECO to MCO.

- Item Master file and new eBOM in same system (eliminates manual downloading and printed document sharing).

- Track Engineering Changes and metrics by status, import date, and responsible engineer.

- Automatic notifications.
Assembly Planner

Bills of Material (BOM) Management

• Import eBOMs into Assembly Planner, either manually or via custom interface from PDM system.
• Create and maintain mBOMs, with direct comparison to eBOMs.
• Visual alerts to imported BOM changes.
• Past BOM revisions saved in the database.
• Process engineers update the mBOM according to engineering changes made by product engineers.
Once the mBOM has been updated, the user can quickly ensure that all parts of the mBOM are consumed by the Routing.

• Compare mBOM to Activity Consumption to determine what changes need to be made:
  • Part Adds
  • Part Removals
  • Part Changes:
    • Quantities
    • Revisions
    • Effective dates
• Drag and drop to edit Consumption.
Assembly Planner can also be used to create and manage Process FMEAs and Control Plans for each Activity.

It can be beneficial to have one location and a linkage between Process data, PFMEAs, and Control Plans.

Assembly Planner uses Automotive Industry Action Group (AIAG) standard PFMEA and Control Plan formats.

Convenient for Review Boards.

Summary reports included.
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Summary & Next Steps
• Complete definition of in-plant logistics and storage for all parts (under all models and variants), from receiving to consumption.
• eKanban and eKitting systems track replenishment requests, container requirements, delivery cycles, and more.
• Streamlined data reduces kitting errors and number of part shortages.
• Label printing, administrative reports, and status dashboards remove errors and unknowns.
PFEP includes storage locations, use locations, container details, replenishment request system, delivery method, and more.

PFEP is linked to mBOM management and line balancing in Assembly Planner, so process planning changes can directly determine logistics changes.
eKanban uses part plans from PFEP to generate barcode labels for each part, which can be put on reusable containers.

Material handlers pick up empty containers and replenish parts with new containers, using handheld scanners to confirm the transactions.

Reports provide live and historical data about cycle times, unfilled requests, kanban counts, and more.

eKanban has reduced delivery cycle time, lineside inventory, part shortages, and number of containers required.
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eKanban has reduced delivery cycle time, lineside inventory, part shortages, and number of containers required.
• eKitting uses part plans from PFEP to generate barcode labels for each part container and rack location.

• Handheld scanners tell material handlers which kits to build and which parts to put in each kit.

• Material handlers scan barcode labels with each transaction (open kit cart, add part, close kit cart, deliver kit cart, etc.)

• Unit status dashboard provides live data about upcoming and completed deliveries. Potential issues are known before they arise.

• eKitting has increased kit accuracy, reduced delivery cycle times, and reduced lineside inventory.
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Centralized Process Data with Integrated Engineering Tools

- Assembly Planner is a Manufacturing Process Management (MPM) system for manufacturing design and planning; which is not a core competency of MRP II / ERP systems.

- Process and industrial engineers manage the official manufacturing process data in one central database (versus a variety of Excel and Word files in a variety of locations), and re-use that data for complex and interconnected functions like process planning, time & motion study, assembly line balancing, and work instructions.
How many different file formats, systems, locations do you have for your various process data (e.g. – Excel, Word, Access - for BOMs, time studies, line balancing, work instructions, etc.)?

What are the annual costs of locating and maintaining data in these disparate files, systems, and departments?

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Assembly Planner
Determine Software & Service Needs

• **Software Priorities**
  • Centralized database of official assembly process data
  • Assembly process planning
  • Work instructions (printed and shop floor viewing)
  • Time & motion study
  • Ergonomics
  • Assembly line balancing
  • eBOM / mBOM management
  • Engineering change management
  • PFMEA / Control Plans
  • .JT virtual assembly
  • PFEP database, Electronic kanban and kitting
  • Facility layout analysis

• **Development Services**
  • Interfaces with PDM or ERP systems.
  • Customized work instruction templates.
  • New reports, interfaces, tools, etc.

• **Support Services**
  • Training
  • Implementation
  • Technical Questions
  • Project Consulting
Assembly Planner
Contact Us to Discuss Resolving Your Issues

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