

# Line Changeover Comparison Study: Flexible Assembly Line vs Highly Automated Fixed Tooling

To compete effectively, today's assembly lines must rely on configurability, distributed control and plug-and-play capabilities to accommodate rapid changes in production requirements. Inflexible assembly lines results in lost opportunities. However, many assembly lines still rely on highly automated fixed tooling, which is not flexible and extremely costly and time consuming to change.

To prove this point, we are providing this actual case study from a global automotive manufacturer customer. At the time of this study, they had two automotive manufacturing plants producing the same V6 engine with similar production rate and model variants. One of the manufacturing plants used the eFlex Assembly architecture and the other had a highly automated fixed architecture. Both lines had 100+ workstations with up to 200 model variants and both sites needed to re-rate production and introduce new models.

## Shutdown Preparation & Execution Plan Comparison

Below is a comparison of the time and details needed to prepare and execute the shutdown and line changeover between the two manufacturing plants.

|                                    | V6 Line with eFlex Assembly                                                               | V6 Line with Highly Automated Fixed Tooling                                                                                                                             |
|------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preparation Before Shutdown</b> |                                                                                           |                                                                                                                                                                         |
| Engineering Prep Work              | 1 plant engineer created the new line configuration offline at his desk within 6-8 hours. | 480 hours of preparation work, backing-up and reviewing PLC & HMI programs, defining scope of work, RFQ work for outsourcing of additional trades and engineering work. |
| Engineering Resources              | 1 plant engineer                                                                          | 3 Engineers, 2 months (engineers were out-sourced, not plant resources)                                                                                                 |
| Trades Resources                   | 8 hours plant trades                                                                      | Various plant trades for pull-ahead work (120 man hours).                                                                                                               |
| <b>Time &amp; Duration</b>         | <b>8 hours during the week leading up to the 2 day weekend shutdown.</b>                  | <b>2 months (480 man hours) leading up to the 1 week shutdown.</b>                                                                                                      |
| <b>Execution During Shutdown</b>   |                                                                                           |                                                                                                                                                                         |
| Engineering Work                   | Download new configuration (15 mins), test stations as they are completed by trades.      | Extensive engineering of PLC logic, HMI programs, RFID changes and drawing changes.                                                                                     |
| Engineering Resources              | 1 plant engineer                                                                          | 4 engineers (3 are outsourced)                                                                                                                                          |
| Trades Resources                   | 6 plant trades                                                                            | 8 plant trades at full overtime, 5 additional outsourced trades                                                                                                         |
| Start-up                           | Running at rate by midday on Monday.                                                      | Slow ramp up to new line rate over 4 days.                                                                                                                              |
| Clean up                           | Normal continuous improvement process                                                     | 4 weeks for cleanup of repair screen messages, reporting and drawing changes.                                                                                           |
| <b>Time / Duration</b>             | <b>2 day weekend shutdown, 200 man hours</b>                                              | <b>9 day shutdown, 1,800+ man hours</b>                                                                                                                                 |

## Key points that demonstrate the power of eFlex Assembly:

1. The highly automated fixed tooling line required a tremendous amount of preparation work that spans over months, compared to just a few hours and days with eFlex Assembly.
2. eFlex Assembly allowed the shutdown to occur over a weekend, with normal production resuming by midday on Monday. The automated fixed tooling line was shut down for 9 days.

## Line Change Chronological Steps with eFlex Assembly

Below are the chronological steps of the shut down and line change for the V6 engine assembly line with eFlex Assembly. The plant staff performed the entire change during a 2-day weekend, with the line running at rate by midday on Monday.

|                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                |                                                                                                                                                                      |                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PREPARATION</b> <b>FRI</b> <ul style="list-style-type: none"> <li>One plant engineer &lt; one day</li> <li>Take configuration offline</li> <li>Redistribute the tasks</li> <li>Create report of equipment locations</li> </ul> | <b>DAY 1 – Shutdown</b> <b>SAT</b> <ul style="list-style-type: none"> <li>Plant trades move affected equipment</li> <li>Download new configuration to affected stations (15 min.)</li> <li>Immediate test and debug</li> </ul> | <b>DAY 2 – Shutdown</b> <b>SUN</b> <ul style="list-style-type: none"> <li>Start moving parts through the line</li> <li>Test functionality and cycle times</li> </ul> | <b>DAY 3 – Startup</b> <b>MON</b> <ul style="list-style-type: none"> <li>Line running at new rate by midday</li> <li>Reporting is accurate</li> <li>New line validation not required</li> </ul> |
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## Summary of Customer's Results

After standardizing their V6 engine assembly lines with eFlex Assembly, the results were significant. This global automotive manufacturer now has the competitive advantage to easily react to any market change within hours and days, instead of weeks and months.

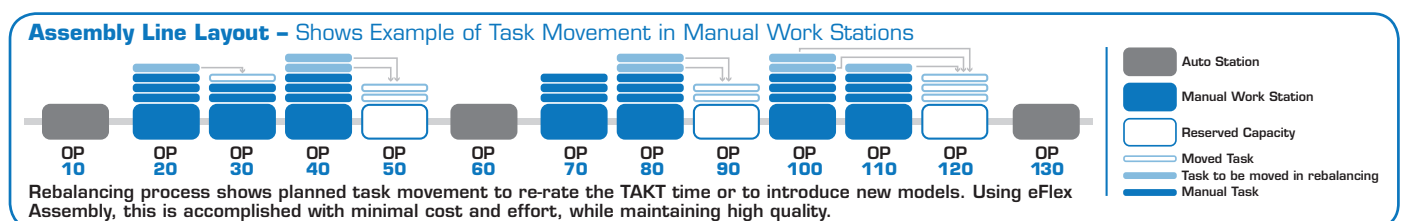
| Customers Overall Results after Standardizing |                                                                                                                                                             |                                                                                                                                     |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|                                               | eFlex Assembly                                                                                                                                              | Highly Automated Fixed Tooling Line                                                                                                 |
| Flexibility                                   | 82% more flexible over traditional architecture.                                                                                                            | Fixed tooling built to manufacture a specific product at a specific rate. Not flexible!                                             |
| Cost for New Assembly Line                    | *35% cost savings on new lines                                                                                                                              | Expensive                                                                                                                           |
| New Line Timing                               | *40-50% faster delivery of new assembly lines                                                                                                               | *Delivery for new assembly lines 1-1.6yrs, may miss a hot market run                                                                |
| Capital Investment                            | 50%-70% of capital can be redeployed for a different product (i.e. V6 engine to 4-cyl engine or transmission). Retool a line for a new / different product. | Expensive and time consuming to redeploy equipment due to fixed tooling built to manufacture a specific product at a specific rate. |
| Cost for Major Change*                        | \$10k – \$30k                                                                                                                                               | \$100k – \$250k                                                                                                                     |
| Line Efficiency                               | Efficiency increases 30-40% from flexibility and immediate detailed feedback from reporting (CPI).                                                          | Reporting can take several weeks to catch up with line changes, resulting in lack of critical feedback reporting.                   |
| <b>Time to React to a Market Change</b>       | <b>Hours / Days</b>                                                                                                                                         | <b>Weeks / Months</b>                                                                                                               |

## Why Does eFlex Assembly Require Less Time and Money?

When using the eFlex Assembly architecture, line changes can happen quickly because:

1. No coding is required.
2. No outsourcing is required.
3. No print updates are required.
4. All reporting and subsystems reflect the new line configuration without coding.

For example, the assembly line layout below shows examples of task movement within manual work stations. The rebalancing process shows planned task movement to re-rate the TAKT time or to introduce new models. Using eFlex Assembly, this is accomplished with minimal cost and effort, while maintaining high quality.



By using eFlex Assembly, this customer can now adapt quickly and easily to market changes and unexpected events, making it ideal for executing and managing the flexible assembly system activities occurring at the MES level. The eFlex Assembly easy-to-use interface enables them to work at the highest level of the process using “best practice” process templates and deploy process flows to specific work stations throughout the flexible assembly system structure, all without being exposed to the controls engineering hard coding or needing to bring the system down.

## What Is eFlex Assembly?

eFlex Assembly is a flexible assembly line optimization solution that includes software, hardware and reporting tools to empower manufacturers to efficiently meet changing demands, increase productivity and ensure quality. Our solution integrates equipment and manpower on the plant floor to create an intelligent manufacturing system that is globally standardized, high quality and highly flexible for production, maintenance, quality, process and training.

The flexible and modular design, technology and tools in eFlex Assembly makes rebalancing or reconfiguring an assembly line as simple as unplugging and re-plugging the equipment. This “plug-n-play” architecture, with your validated standardized processes, drastically reduces changeover time. No debugging, outsourcing, new PLC logic development or print updates are needed!

## Want to Talk With Us?

Today's manufacturing companies need to be able to change an assembly line in “hours and days,” not “weeks and months.” Changing demand requires rapid response and the key to this is “flexibility.” Your assembly line's output must reflect market demand, adapt in a fraction of the time, and maintain quality. eFlex Assembly by eFlex Systems is the solution that does it all.

If you would like to learn more about reducing costs, increasing flexibility, and improving quality, contact us or go to **[www.eFlexAssembly.com](http://www.eFlexAssembly.com)** to request a demo about eFlex Assembly, or any of our other manufacturing solutions.



Flexible Manufacturing  
Software Solutions

## Integration Options

There are significant synergies to be gained by implementing eFlex Assembly with our other solutions, eFlex Vision (vision image management software), eFlex Track & Trace (traceability and quality management software) and eFlex Kitting (modular and configurable kitting solution). Ask us for a one-on-one demo to learn more.



## Contact Information

Request a free demo at [www.eFlexAssembly.com](http://www.eFlexAssembly.com) or call (248) 651-5979.  
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