Tesla wants to increase the production of its Megapacks and intends to streamline the production process to keep up with anticipated demand. As of today, Tesla’s production capabilities for the Megapack at the Lathrop Megafactory are not optimal. The team has been tasked with constructing a discrete event simulation of their Megafactory and has split the project into 3 phases:

**Phase 1**
- Preliminary model
  - This includes building a basic model with the exact process and current parameters. This is mainly to understand the current process, production capacity, and constraints.

**Phase 2**
- Bottleneck Analysis
  - In this stage, the data provided will be used first to find the bottleneck and then analyze how it can be overcome. Propose multiple solutions and alternate approaches to overcome the bottleneck.

**Phase 3**
- Future State
  - This state is when we consider the other sensitive factors affecting the total production time and suggest improvements for future changes in demand as well as growth.

### Project Scope

- **Challenges**
  - Producing Megapacks as efficiently as possible with minimal bottlenecks.
  - Meeting demand target of 45 to 50 Megapacks produced in a week.
  - Minimal to no budget or space to make production changes.

- **Project Requirement**
  - Identifying production issues using real-time results, and visualizations for each machine in the system. Use the simulation results to implement changes within the model to produce 45 to 50 Megapacks/week.

- **Process to Recommendation**
  - FlexSim Simulation
    - Create and simulate the production process using real-time machine and cycle times.
  - Metric Dashboard
    - Develop dashboard metrics on throughput, output, and state bars.
  - Bottleneck Analysis
    - Analyzes which machines require a lower cycle time or cease delays in order to meet demand.

- **Impact**
  - Improved production, efficiency, and quality within Tesla’s Gigafactory.

### Methods & Restrictions

**Method**
- Model was created on FlexSim using the CAD drawing of the facility layout. Based on the statistical data and constraints input, the simulation showed the number of units produced, and collected in each sink. Those units were fed to the source of the next production line. Finally, every part is assembled and then tested in the EOL.

**FlexSim Restriction:**
- 30 block model limit.

**Solution**
- The model was separated into parts based on the colors of the model. The production line simulation was integrated using the sources and sinks.

**Client Restriction:**
- Budget and space constraints limited.

**Solution**
- Incorporated future growth and analyzed the bottlenecks to eliminate waste idle time make the cycle time shorter and increasing productivity.

### Current State

- Less than 205 minutes cycle time per asset
- 44 assets per week
- Multiple Bottlenecks (Less than 50% utilization)
- Processors are in series
  - Increased change of Mean Time Between Failure
  - Increased bottleneck processors
- Uneven distribution of cycle times among processors
- Space constraints
  - Cannot add more processors

### Recommendations

- Analyzing how the final output is affected by reducing the cycle time of the Bottleneck stations
- By reducing cycle time of the stations by 50% the Megafactory can produce 6 more Megapacks
- After reducing the cycle time by 50%, the processing time for each bottleneck station was also reduced.
- The processing time improved for each station by up to 83%.
- Overall, to have a significant production increase per week it is recommended that the cycle time for each of the bottleneck stations is decreased by half. A possible solution to reduce the time is by adding a parallel station to each bottleneck.

### Conclusions

- **Next Step**
  - Improve production efficiency by further reducing cycle time
  - Test possible solutions using the simulation model
  - Analyze the economic aspect of adding parallel stations

- **Takeaways**
  - Conduct production line simulation using FlexSim
  - Bottleneck and Cycle Time Analysis
  - Make recommendations based on technical and economic aspects