



## HIGH-VOLUME E-COMMERCE PRINTSHOP OPERATION

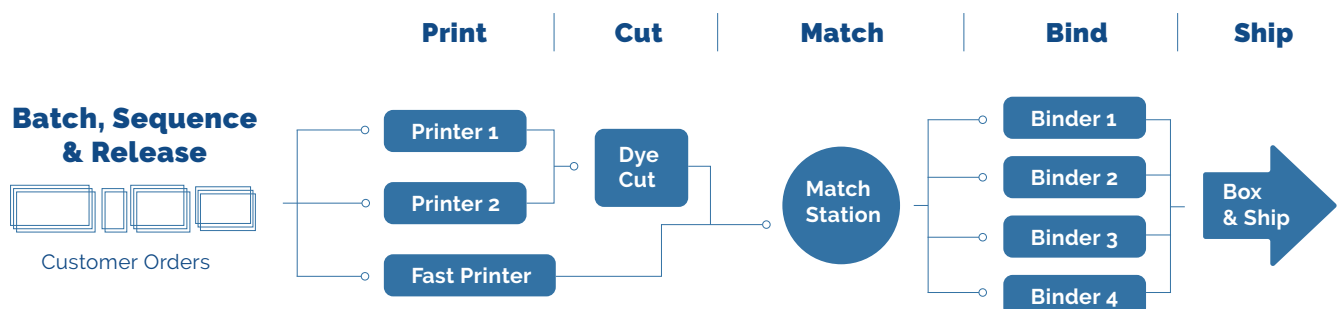
### Background

A *high-volume e-commerce printing operation* invites customers to *upload a design and then order products* such as photobooks, calendars, and other *personalized items* from the company's online store.

The primary *business goal* of the company, for *customer-satisfaction* and revenue reasons, is to *maximize on-time-shipments*, measured as the *percentage of orders that ship* on or before the planned ship date.

- *Orders* can have multiple items that must be *consolidated for shipping*.
- *Multiple production machines* exist, with *multiple routings* possible coupled with *sequence-dependent setup times*.
- Tens of *thousands of orders are entered each day* during peak periods and, on average, *the company generates over fifty-thousand* production tickets per day.

### High level flow chart of process



## The Challenge

Current scheduling was *performed on a rudimentary "first-come, first-serve" basis*. The only *"intelligence"* added was that, *for a given backlog of production tickets*, similar items were processed together as batches, *to minimize changeovers*.

This *scheduling was non-optimal*, causing *delays in shipments*, and an *inability to predict the delivery time of orders* – both *customer satisfaction issues*. The complexity of scheduling meant that *no manual nor COTS/Excel solution* was possible.

During *critical peak* holiday months between October and the end of December, *on-time shipments were unacceptably low*, less than 75%. This resulted in *low customer satisfaction* and reduced the chances for repeat business.



## OptPro Solution

OptPro was *implemented to optimize for: (1) multiple machines* and their availability; and *(2) appropriately timing* the release of "related" items *for consolidation* of *final shipments to customers*.

Further, to *limit WIP inventory* for a *given customer order*, the release of items with much *shorter processing times* was timed in such a way to finish processing at approximately the *same time* as those items *with longer processing times*. An *optimal indexing function* was used to determine *item release times*, and a digital twin of the process was implemented to *validate scheduling decisions*.

Due to the *large volume of incoming orders*, the *scheduling procedure was repeated* at various intervals during the day, or whenever a *major disruption* occurred in the plant. This was necessary to avoid *excessively large volumes of backlogged orders*, and ensured that the *optimization ran quickly*, and produced *high-quality results*.

## Results

*During non-peak months* of operation (January through September), **OptPro improved on-time shipment** of customer orders from an average of **< 90%** to **between 98% and 99%**.

*During peak holiday months* (October through December), **OptPro improved on-time shipment** of customer orders from an average of **< 75%** to **between 92 and 96%**.



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