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Intelligent Planning & Scheduling

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Improving Order Sequences by Replacing a Legacy System

Background

A major auto OEM was faced with the challenge of replacing its legacy system for order sequencing. With increased complexity due to new models and production mixes, the current solution was not able to perform and solve the OEM's production challenges. The heuristics-driven competitor was not able to produce a buildable schedule, which was causing schedulers to spend hours manually correcting the sequence
for the shop floor.

The requirements were as follows:

- Body style rotation pattern of 6-8 of Unit A (high runner), 3-4 of Unit B, 3-4 of Unit C, and 0-1 of Unit D (low runner)
- Exhaustive color batching pattern over the entirety of the sequence (weight set at 10,000)
- Run length constraints for various features (set at a penalty of 10)
- Other constraints like smoothing, spacing, and changeover are set as lowest priority (weight set at 1)

An apples to apples comparison was conducted, evaluating the legacy sequence and the Optessa sequence using the same constraints. The legacy sequence was generated using a sort-key on the body style whereas the Optessa sequence was generated using our patented algorithms. The legacy sequence resulted in a penalty of 512,869.397 while the Optessa sequence generated a penalty of 4,070.179.

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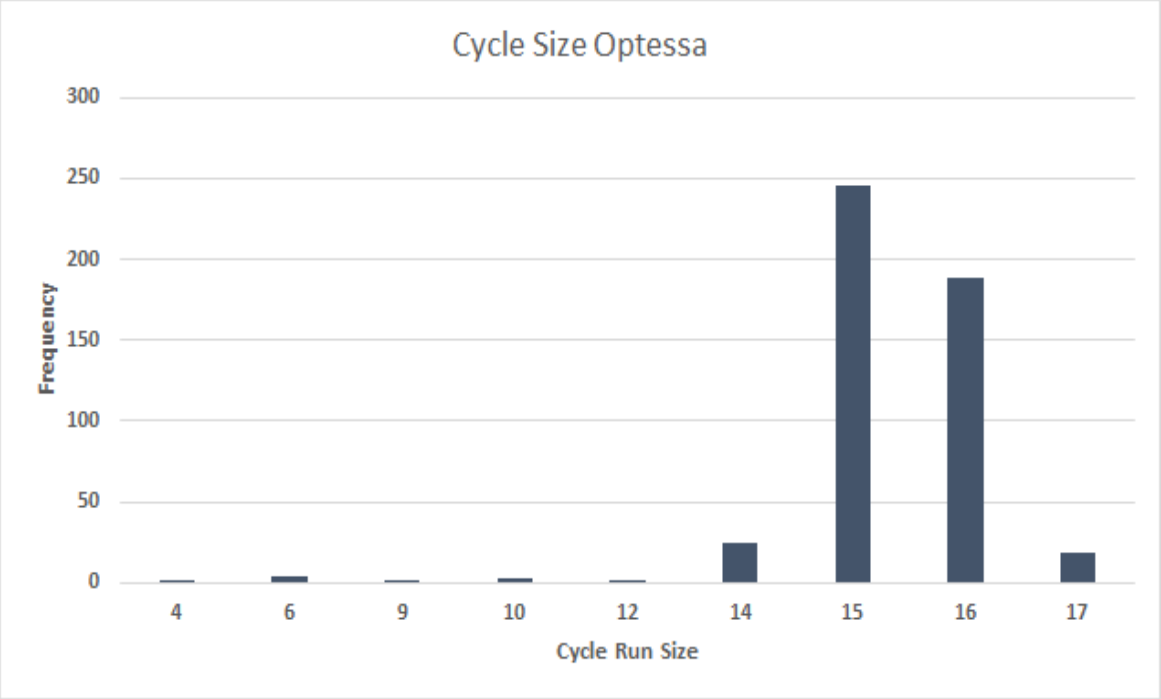
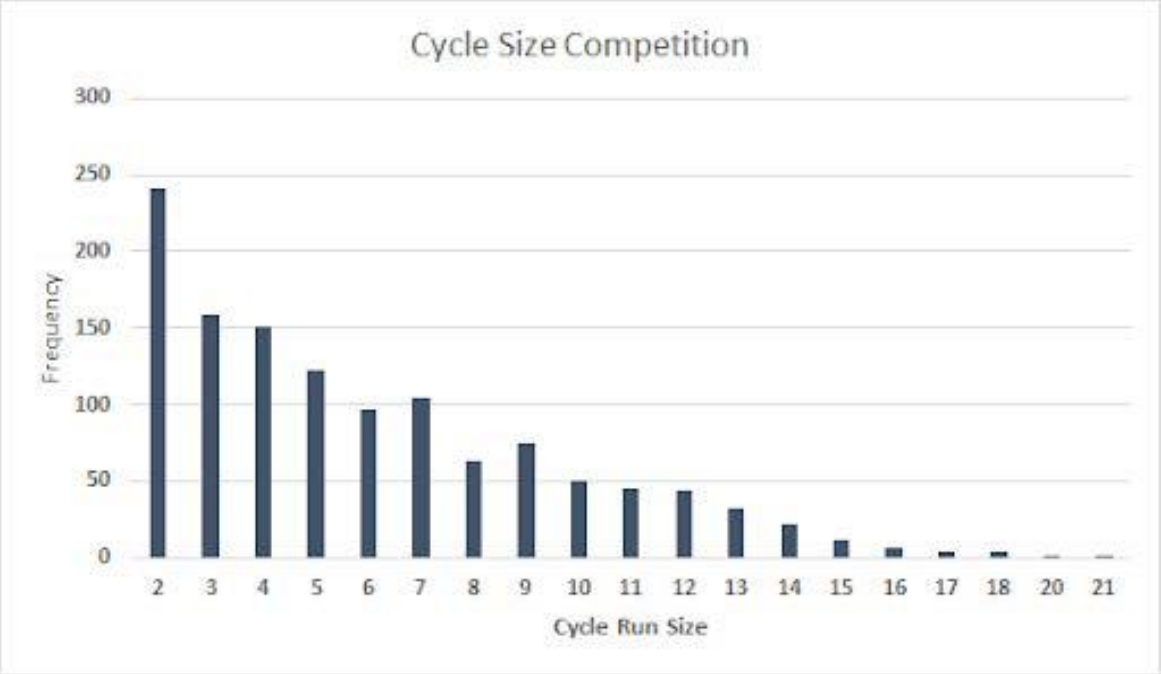
Body Style





The desired cycle size for the body size was 15-16. Optessa generated a sequence with 245 instances of cycle size 15 and 189 instances of cycle size 16, accounting for 89.3% of the total cycle sizes generated. The competition sequence, on the other hand, generated a sequence with 12 instances of cycle size 15 and 7 instances of cycle size 16. This accounted for 1.5% of the total cycle sizes generated.

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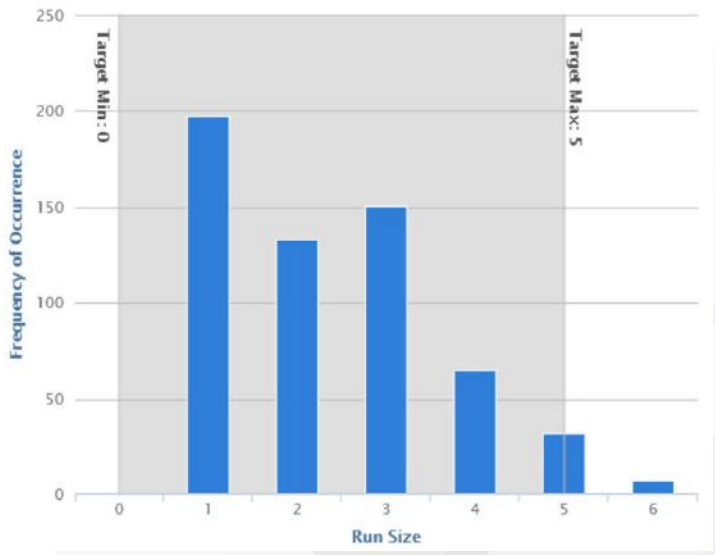
Run Length Colors

The exhaustive color pattern was the second high priority constraint, with the goal of running all of color batch 1, all of color batch 2, and so on until color batch 5. Furthermore, units in blue were to be scattered throughout the sequence, with no more than 2 consecutive units of blue in a row.

Above is the competition sequence. At the beginning of the sequence, the heuristics-driven model violates the color batching rule by inserting a unit from color batch 4. Furthermore, there are runs of blue units that are greater than 2 noted in the fourth and fifth time bins.

Above is the Optessa sequence, which satisfies all color batching requirements. The order of batches is observed, and runs of blue units are not greater than 2.

Below are further comparisons of the maximum run lengths for a specific color:



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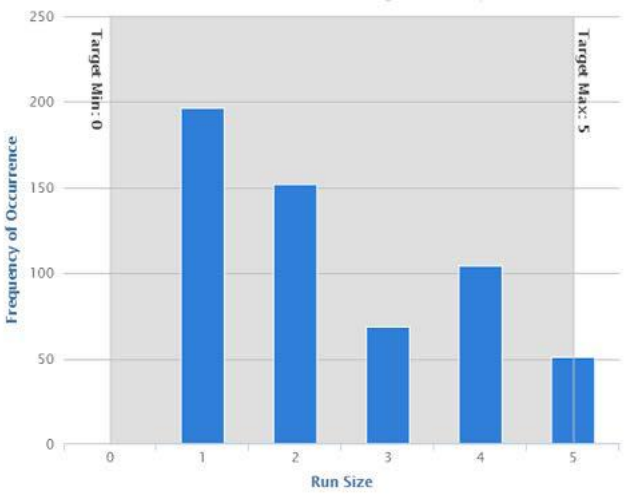
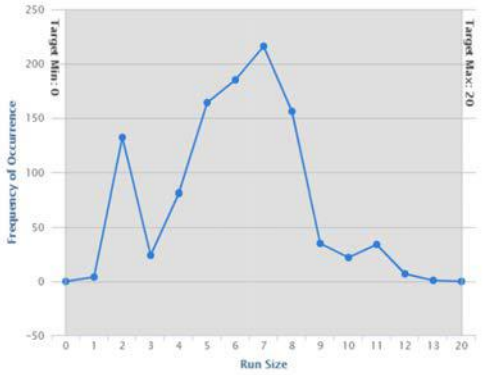
The above image shows some violations of the max run length for this particular color in the legacy sequence.

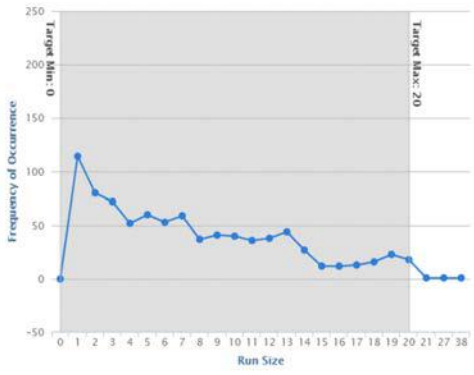


This image, in contrast, comes from the Optessa sequence and shows that the max run length rule for this color is met.

Run Length 4WD

Below is an example of another sequencing rule that the Optessa sequence was able to meet over the legacy sequence. The rule was that there could only be a maximum of 20 4WD units in a row. On the left is the Optessa sequence, which respects this rule. The legacy sequence on the right violates this rule





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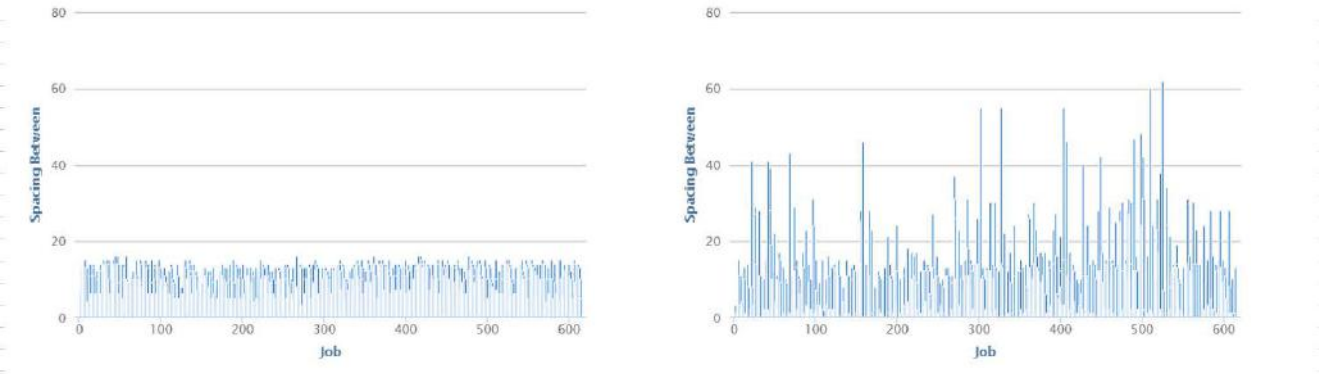
Leveling

Finally, smoothing constraints were applied to certain features to achieve an even distribution of the specified order features throughout the sequence.



On the left is the Optessa sequence showing an even distribution of the order features throughout the sequence, and on the right is the legacy sequence showing uneven distribution of the same order features.

Through Optessa's optimization and extensive capabilities, the schedulers were able to produce high-quality sequences that addressed their production challenges more efficiently.

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About Optessa

Optessa is a leader in intelligent planning, sequencing, and scheduling optimization software with many successful implementations among top tier global manufacturers. Optessa products have wide applicability in industries as diverse as auto OEMs, suppliers, power equipment, electronics, semiconductor, mills; batch process industries such as food and beverage and paints as well as shipping and logistics. The company has offices in Edmonton, Alberta, Canada; Hazlet, New Jersey, USA and Goa, India. Optessa's leadership team combines deep expertise in software, mathematics, manufacturing, and optimization technologies with unmatched customer commitment. Optessa supports global deployment at more than 100 distinct manufacturing facilities and production areas. We also partner with industry leaders, Deloitte and Tech Mahindra, to further enhance our client support.

To learn more about Optessa please visit www.optessa.com.

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Multi-zone Production Sequencing

Multi-stage Production Scheduling