Abstract Book

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divides the problem into three stages. The first stage is further divided into two phases. In the first phase, a MILP model determines which mold is used with each injector group on each machine in each interval of the model's time partition, with the objective of minimizing response times subject to the relevant constraints. In the second phase, the same model sets the order production deadlines based on the first-phase solution with the objective of minimizing overproduction. Since the first stage results overestimate down times due to mold changes, the second stage consists in running an LP model to correct them. Finally, in the third stage a MILP model determines the colour for each mold type in each time interval with the objective of minimizing colour changes.

Keywords: scheduling; total tardiness; heuristic; parallel machine problem

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Scheduling in additive manufacturing problems

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December 15, 2022 (Thursday), 14:00 - Room 1301

Scheduling problems in additive manufacturing is a problem that can involve considerably more complexity than single-stage scheduling problems, since machines can process more than one part with different geometries simultaneously [1]. To achieve efficiency in terms of the used capacity of the machine, it is necessary to group as many parts as possible in a single job. Since the use of the machines in terms of time depends on the job being processed, how parts are grouped within each job comes critical. This implies that the resolution of the nesting problem will have a direct impact on the objective function of the jobs Schedule. In this work, the objective function to be minimized is the Total Completion time, wich is obtained by the sum of the completion time of each job. The biggest difficulty is that the problem is NP-Hard [2], so a purely mathematical approach is insufficient. For this reason, a hybrid method is proposed that allows linking the benefits of an approach based on mathematical programming but enhanced by heuristic methods. In this way, heuristics are developed that address the nesting problem incorporating knowledge about the nature of the problem, such as the influence of the parameters "height" and volume" of the parts in the definition of the Jobs; and the structure of its solutions. Then, using mathematical programming, solve the scheduling in parallel additive manufacturing machines. For the nesting stage, several heuristics were proposed and compared, showing that those heuristics that best captured the influence of the parameters contributed more to solving the problem.

References

1. Qiang Li, Ibrahim Kucukkoc, & David Z. Zhang (2017). Production planning in additive manufacturing and 3D printing. Computers and Operations Research, 83(2017), 157-172.

2. Kucukkoc, I. (2019). MILP models to minimise makespan in additive manufacturing machine scheduling problems. Computers & Operations Research, 105, 58-67.

Keywords: Scheduling; Additive Manufaturing; Heuristics; Nesting; Total completion time

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An optimization approach for process quality profile modeling

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December 15, 2022 (Thursday), 14:00 - Room 1301

Process Quality Profile Modeling consists of collecting data on the behavior of the variables and the product quality characteristics and quantifying the interrelations between process key inputs and outputs. It allows estimating the results of the products quality characteristics from the process variables values. The main objective of quality profiling is to develop models for improving processes and product quality. This work develops a model of process quality profile using Goal Programming (GP) to determine the optimal levels of process variables and product quality characteristics in a carbonated beverages process. The model has one input variable and four process variables influencing the performance of the response variable (main quality characteristic of the product). Initially, a process capability study and a multiple linear regression analysis were carried out, obtaining the general equation and four associated constraints. Then, a variability analysis was carried out to determine the correlation coefficients between the variables and the quality