A Polynomial Approach for a Graphical-based Integrated Production and Transport Scheduling with Capacity Restrictions

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Abstract : The performance of global manufacturing supply chains depends on the interaction of production and transport processes. Currently, the scheduling of these processes is done separately without considering mutual requirements, which leads to no optimal solutions. An integrated scheduling of both processes enables the improvement of supply chain performance. The integrated production and transport scheduling problem (PTSP) is NP-hard, so that heuristic methods are necessary to efficiently solve large problem instances as in the case of global manufacturing supply chains. This paper presents a heuristic scheduling approach which handles the integration of flexible production processes with intermodal transport, incorporating flexible land transport. The method is based on a graph that allows a reformulation of the PTSP as a shortest path problem for each job, which can be solved in polynomial time. The proposed method is applied to a supply chain scenario with a manufacturing facility in South Africa and shipments of finished product to customers within the Country. The obtained results show that the approach is suitable for the scheduling of large-scale problems and can be flexibly adapted to different scenarios.

Keywords : production and transport scheduling problem, graph based scheduling, integrated scheduling
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