

FLOW AND RESOURCE EFFICIENCY MEASUREMENT METHOD IN OFF-SITE PRODUCTION

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1 BACKGROUND AND IDENTIFICATION OF PROBLEM /KNOWLEDGE GAP

- The significance of flow efficiency in construction increases continuously even if the focus on high resource efficiency still dominates.
- Flow and resource efficiency describe two competing target viewpoints, which focus on reducing non-value adding activities and maximizing resource utilization, respectively.
- Recent research has shown that balancing both perspectives provides a viable solution.
- The exact measurement of flow and resource efficiency in construction remains unclear.

2 RESEARCH AIM AND METHODOLOGY

- The research aim is to evaluate a possible measurement method of flow and resource efficiency in the off-site production context of industrialized house building with volumetric element construction, and assess the industrial relevance thereof.
- Work sampling has been used to collect data from a multi-storey building project flowing through the off-site production system of a construction contractor.
- Observation notations has been designed to capture the flow of elements through the production, the flow of operators between the elements, and the achieved value transformation.
- The validity of the method has been checked statistically, through a focus-group workshop and with capacity estimates from the case company.

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3 RESEARCH FINDINGS

- Observations on the flow of elements and the achieved value transformation enable the calculation of flow efficiency.
- Observations on operators enable the calculation of resource efficiency.
- The calculations of flow and resource efficiency can be visualized combined on different aggregation level, e.g. on volumetric element type level (figure 1).
- For the measured element types in the case, flow efficiency varies broader, between 19-48% while resource efficiency varies narrower, between 81-92%.

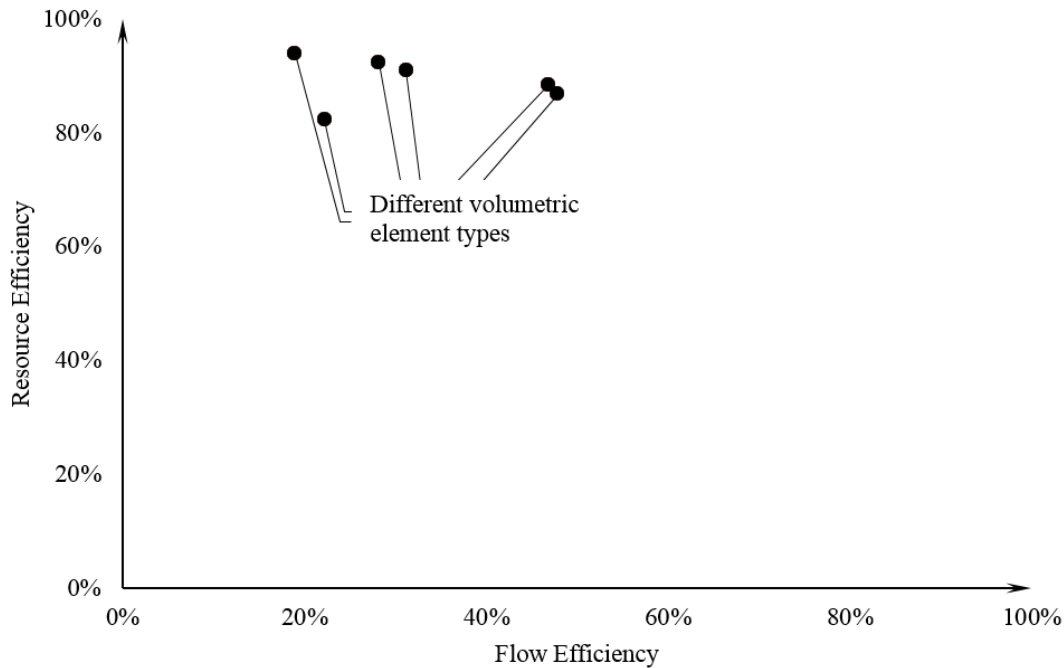


Figure 1: Flow and resource efficiency per volumetric element type.

4 CONCLUSIONS

- Flow and resource efficiency can be measured in the off-site production context of volumetric element construction.
- The measurement method delivers figures for flow and resource efficiency to enable discussions about differences and similarities between the defined volumetric element types and possible consequences for the production system.
- Work sampling can be used as a data collection method.
- Discrete observations are correlated with the physical production flow for the chosen observation interval.
- Work sampling remains a time consuming method for the observation object considered.
- The question of balancing flow and resource efficiency is an important issue for the case company. Strategic targets of improving flow (expressed by takt or reduced throughput time) meet operational goals of using minimum resources (expressed as operator times spent)

