

A bidding scheme for processing glass

October 31, 2019

Our company is organising a large-scale glass recycling scheme. One component of the scheme is to organise a bidding process for so-called processing facilities and trying to find the bids that maximize the overall profit of our operation. We would like to design a system that selects the optimal bids in a short amount of time.

In more detail, our scheme is organised as follows: *Raw glass* is collected in so-called *collection areas*. From there it is transported to *processing facilities*, where it is sorted, cleaned, and processed to yield so-called *cullet*. The cullet is then transported to *customer factories*, where it is used in glass making.

We have to pay for the transportation and the processing facilities. We earn money by selling the cullet to the factories.

For this project, we are interested in the bidding process we run to determine which processing facilities we use. Every year the facilities are invited to submit a number of bids. These bids consist of:

- cullet type
- price per ton
- min amount
- max amount

A facility is allowed to submit multiple bids per type.

At the moment, we are running a software with an integrated optimization module that chooses the winning bids and calculates the mass flow between the different collection areas, processing facilities, and customer factories. We also have some rules that disallow the transport of small amounts of raw glass to processing facilities.

However, the time it takes to run a single bidding round is too long. We can typically allow customers only to submit their bids up to the end of a working day and then give out the results on the next day. We would like to be able to do multiple bidding rounds per day.

Additionally, we have the problem that the amount of raw glass is not distributed equally over the year. So, we would be interested to even out the amount of raw glass

that we transport to the processing facilities over all months of year. We are also uncertain about the overall amount of raw glass we obtain in each year. Our commitment to the processing facilities, however, should be kept, even when the amount of raw glass is lower than predicted.

Your goal is to make us a proposal for a new bidding module that allows us to make multiple bidding rounds per day. We would be interested in new techniques for the optimization module, but we are also open to changes to the bidding process itself.

We can provide you with data for the different collection areas, loss rates during processing, transportation costs, revenues for selling cullet, and a set of bids.