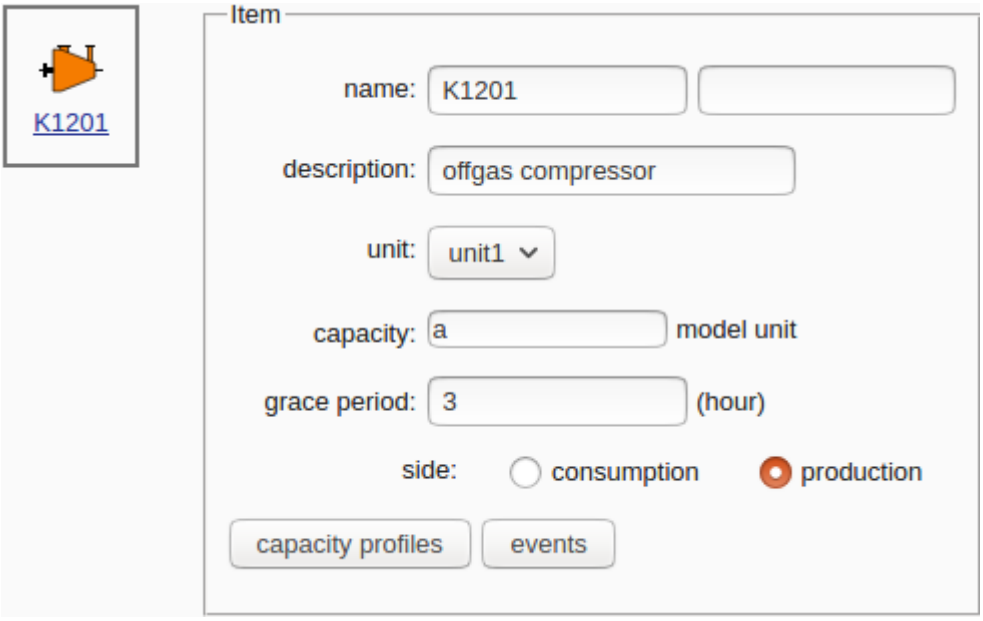
Items

An item is an individual component of an integrated system, such as a well or an injection compressor.

ARTIS ensures that the names of the items are unique. When pasting, ARTIS uses the first free alphanumerical successor for the new item names. But the item name postfix is kept the same, making it easy to copy and paste complete trains or other subsystems that have consistent tag numbering.



For an item with a positive grace period, its downtime does not reduce system capacity immediately, but only after the grace period has expired. For example:

- when an off-gas compressor has failed, we can flare the off-gas for a maximum of 3 hours before gas production needs to stop
- off-spec condensate can be sent to the off-spec tank but after 6 hours it is full
- if there is a failure of power supply, the process control system continues to run on the uninterruptible power supply for at most 24 hours.

Since the grace periods are defined on the items, they affect the diagram perspective results, not the unit perspective results. All planned and unplanned downtime events get the full grace period, even for consecutive events on the same item, component, and mode. Hence, the grace periods assume that the temporary backup is always available whenever the item has a downtime event. In case of doubt, the network buffers can be used as a more realistic way to model it.

Production and consumption

An item is either on the production or the consumption side. The consumption items define the demand, so they set the context. Hence, the two sides are asymmetric; everywhere in the diagram hierarchy, the results are relative to the demand.

For a consumption item, its demand is defined as its expected capacity, in the usual way, that is by taking account of the planned and unplanned downtime.

For a production item, no demand is given.

A model, or any selection, has given demand if it has at least one consumption item and one of the following

situations applies:

- a series has given demand if and only if at least one of its elements has given demand
- a parallel arrangement has given demand if all its elements have given demand
- a network has given demand if and only if all paths from source to sink have given demand.

For a model, or any selection, that doesn't have a given demand according to the above rules, the demand is assumed to default to the peak capacity. This convention makes the consumption modelling consistent with all previous ARTIS versions, standard reliability block diagram terminology, and with the ISO 14224 and ISO 20185 definitions.

How it works

In a run, ARTIS always first computes the available capacity of the items that are on the consumption side. This first step results in the demand, which sets the context for the final results. This is representative of real-world cases where the overall performance of a system is measured on its ability to meet an a-priori given demand. The consumption limits act as a cap or choke with any production in excess of it being ignored as surplus, because it is not needed. Losses are only incurred when the system fails to meet this demand.

The designation of items in the model as 'production' or 'consumption' has no effect on the final simulation, which always takes account of the full model. Hence, the distinction between production and consumption does not affect any buffer results.

Curtailment modelling

For a model that satisfies two necessary conditions, ARTIS computes the curtailment instead of the losses. These conditions are:

- the network must have buffers, and
- the consumption is defined at the source, and not at the sink.

Curtailment is measured at the source, but all other definitions are the same as in a normal run.

When demand exceeds production, there is a shortfall either due to planned and unplanned downtime or to system capacity constraints. As a corollary, when production exceeds demand this leads to curtailment. In that case, the available production is curtailed due to a lack of demand and a lack of storage capacity. This can be modelled in ARTIS by reversing the production and consumption designations, i.e. production items become consumption items, and vice versa.

For example, in a model with upstream facilities, network infrastructure, and downstream facilities, the upstream can be designated as consumption, and the network and downstream both as production. The results are then calculated based on the available capacity of the upstream. When this exceeds the available capacity of the network and the downstream, the upstream incurs losses. The ARTIS results then show the impact of planned and unplanned demand fluctuations and network bottlenecks on the capacity to transport and consume the available upstream capacity. This curtails the available upstream capacity.