

Total Optimization Plant Simulation Input Requirements

Items Required For Effective Process Modeling

The K-TOPS® modular modeling approach is broken into three key modules – equipment, recipes, and schedule.

Information Required

1. Equipment/Unit Operations required

Unique equipment types, quantity of an equipment type, and specific parameters about that equipment type (volume, flux, etc.) pertinent to processing steps and/or times.

For example, Seed Fermentors, Main Fermentors, Media Hold Tanks, Media Prep Tanks, CIP Skids, etc.

2. Sequence of Unit operations – Recipe order

For example: Seed Fermentor -> Main Fermentor -> Harvest Tank

3. Steps during each operation – Recipe Step sequence

(For Example: Seed Fermentor)

Clean (CIP)	2.5 hr
Sterilize (SIP)	2 hr
Add Media	1 hr
Wait/Sample	0.25 hr
Inoculate	0.5 hr
Growth	24 hr
Transfer	2 hr
Clean (CIP)	2.5 hr

CIP and SIP does not have to be detailed, but can be if desired.

Note that step durations can be fixed numbers, quantities based upon other information, or a range of time. Depending upon the objective, a unit operation may only require one or two steps at the beginning, with a more detailed breakout of steps occurring as time continues.

4. Resources consumed during operation – Recipe Step resources

This is used to generate histograms, resource demand timelines and daily resource summary tables. These may not be required during an early phase of a simulation effort.

(For example – 50 L media consumed during Add Media step; 1 CIP skid utilized during Clean (CIP) step)

5. Capacity / Batch Starting requirements – Schedule

For example: Start a new batch every 5 days, or start 2 batches per week (Mon and Wed), etc., or achieve 5 kg product per year.

This is desired for each product. Based upon production objectives, operating schedules can be developed.

For existing facilities, operating philosophy, such as number of operating days/week, shifts/day, and weeks per year would be helpful in ensuring the desired capacity is met or exceeded within the desired time frame.

6. Any unique operational activity performed

For example – CIP expiration timer of 96 hrs requires that the equipment be CIP'd prior to processing if it has not been cleaned at the end of a previous batch within 96 hrs.

Note: These unique operational activities are usually identified during the initial data gathering visit or are considered options explored during later stages of the modeling effort.

7. Mass balance information

Mass balance information is helpful, but it can also be developed from performing a simulation effort.

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