Adaptation of Britest Tools For Fermentation Whole Process Understanding

Britest Members' Day – 22 Oct 2015, Manchester, UK

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Challenge

Apply Britest tools and methodology to whole process understanding of fermentation processes and technology transfer to the manufacturing plant.

Approach

Complete up to three Britest sessions for each stage of transfer:

1. Review of technical package coming in
2. Review of lab and pilot scale data from feasibility work
3. Process scale-up and transfer into manufacturing plant

Goal: Design and **ADAPT** Britest tools to support each of these activities for fermentation-based processes.

ISA

Tool Objective: Clearly define objectives of session and contraints on scale up (CapEx, Equipment availability).

Define the problem
Define the contraints
Define the objectives/focus of this Britest session

Key Outputs: Objectives and constraints of process implementation plan.

IAT

Tool Objective: Comprehensive review of fermentation process parameters and interactions.

		Key Outcomes (Measurements)									
		Growth Rate	Max Cell Mass by Viscosity	Sustain Cell Viability by high CER	DO (%)	Intermediate Impurity Concentration	Final Product Concentration	Product Purity	Drive to Increase	Optimum	Drive to Decrease
Operating Conditions	**Studied Range**	**2**	**3**	**3**	**2**	**4**	**5**	**5**			
Seed viscosity	200-900 cp	?	?	?	?	?	?	?			
Soyflour Conc.	5-25					?	?	?	8		2
Initial pH control set point (up to 24 hr)	7-7.5					?			12		5
Final pH control set point (24+)	7-7.2					?	?	?			
Substrate ratio in feed	1.2-1.6								10		
Inital Substrate feed rate	60-90								2	3	17
Mid/late cycle feed rate	30 - 120								2		17
Temperature	33-34 C		?						2		
Agitation Rate	550-700 rpm					?			4		
Aeration	24-30 lpm					?			4		
Total substrate fed	600-1050								5	5	3
Cycle Time	7-10 days								10		4

Key Outputs: Gap analysis and experimental plan for fermentation process optimization.

Solution

Complete cycle as needed for each stage of tech transfer

DUDES

Tool Objective: Adapted DUDES used to connect to PDD and identify additional data needed to make equipment decision.

	PDD Step	Must Achieve	Must Avoid	Data Needed / Comments	Possible Equipment
10	Fermentation				
20	Cell Removal				
30	Solvent Extraction				
40	Wash				
50	Filter				
60	Crystallize				
70	Isolate				
80	Dry				

Key Outputs: Equipment selection and gap analysis for each step or list of data needed to make equipment decisions.

PDD

Tool Objective: Comprehensive understanding of recovery process steps.

30 Extract	→	40 Wash	→	50 Filter	→	60 Crystallize

Key Parameter Conditions				
Existing Equipment or CapEx for Registration				
Key Data Needed				

	Solvent 1	Solvent 2	Solvent 3	Solvent 4
Advantages (steps 30 and 60)				
Disadvantages (steps 30 and 60)				
Additional data needed	Step 30 Step 60	Step 30 Step 60	Step 30 Step 60	Step 30 Step 60

Key Outputs: Gap analysis and experimental plan for data needed to finalize process flow.

Benefits

Approach provides comprehensive and systematic way to review fermentation processes. Quickly brings all members of project team up to speed, and focuses team on key activities needed for efficient transfer of process to manufacturing plant.