

Supporting Information

The Evolving State of Continuous Processing in Pharmaceutical Manufacturing: A Survey of Pharmaceutical Companies and Contract Manufacturing Organizations

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The survey was conducted using Survey Monkey (www.surveymonkey.com), a link to which was sent to all participants. The following is a printout of the survey.

Section A: Personnel Information

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27%

3. Do you have a team of people (chemists/engineers) that dedicates greater than 50% of their time to pharmaceutical continuous manufacturing?

- ☐ Yes
- ☐ No

4. What is the total size of the group that dedicates greater than 50% of their time to pharmaceutical continuous manufacturing?

- ☐ 1-5 people (chemists/engineers)
- ☐ 6-10 people (chemists/engineers)
- ☐ >10 people (chemists/engineers)

5. If you don't have a dedicated team, what number of people (chemists/engineers) at your organization have experience (greater than 2 projects) developing a continuous process?

- ☐ 1-5 people (chemists/engineers)
- ☐ 6-10 people (chemists/engineers)
- ☐ 11-20 people (chemists/engineers)
- ☐ >20 people (chemists/engineers)
- ☐ Comment

6. Please select the percentage of people which fall into the following categories.

	No Degree	Bachelors Degree	Masters Degree	PhD
People dedicated greater than 90% of their time to Continuous Process development	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
People dedicated 50-89% of their time to Continuous Process development	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
People dedicated 5-50% of their time to Continuous Process development	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Each entry consisted of a drop-down with the following options:
< 10%, 11-25%, 26-50%, 51-75%, >75%

7. Please reflect on the composition of a typical team you might assign to a project. Indicate how many people with each educational background are assigned to the project.

	No Degree	Bachelors Degree	Masters Degree	PhD
Process Chemists	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Each entry consisted of a drop-down with the following options:
1, 2, 3, 4, >=5

	No Degree	Bachelors Degree	Masters Degree	PhD
Analytical Chemists	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Process Engineers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Automation Engineers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Project Managers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Technicians	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

8. Comments on Section A: Personnel Information/Staff Resourcing Approach

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Section B: Equipment Experience - Continuous Reaction Infrastructure

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36%

Do you have continuous processing capabilities in any the following areas? When responding, use the following scale of 0-3 and select as many boxes per row as necessary.

0 = No capability

1 = Have capability

2 = Extensive Use (Used for at least 2 projects in last 3 years)

3 = GMP Qualified

9. Please respond for Plug Flow Reactor - Heated liquid only.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Please respond for Plug Flow Reactor - Heated liquid only.

< 1 kg

Pressure range:

< 1 kg

Temperature max:

1 - 20 kg

Pressure range:

1 - 20 kg

Temperature max:

> 20 kg

Pressure range:

> 20 kg

Temperature max:**11. Please respond for Plug Flow Reactor - Cryogenic liquid only.**

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Please respond for Plug Flow Reactor - Cryogenic liquid only.

< 1 kg

Temperature minimum:

1 - 20 kg

Temperature minimum:

> 20 kg Temperature minimum:

13. Please respond for Packed-Bed Reactor (solid/liquid or solid/liquid/gas).

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. Please respond for Packed-Bed Reactor (solid/liquid or solid/liquid/gas).

< 1 kg

Pressure range:

< 1 kg

Temperature:

< 1 kg

Gases Used:

1 - 20 kg

Pressure range:

1 - 20 kg

Temperature:

1 - 20 kg

Gases Used:

> 20 kg

Pressure range:

> 20 kg

Temperature:

> 20 kg

Gases Used:

15. Please respond for Plug Flow Reactor (gas/liquid).

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Please respond for Plug Flow Reactor (gas/liquid).

< 1 kg

Pressure range:

< 1 kg

Temperature:

< 1 kg

Gases Used (List):

1 - 20 kg

Pressure range:

1 - 20 kg

Temperature:

1 - 20 kg

Gases Used (List):

> 20 kg

Pressure range:

> 20 kg

Temperature:

> 20 kg

Gases Used (List):

17. Please respond for CSTR - Low pressure.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Please respond for CSTR - Low pressure.

< 1 kg

Range:

1 - 20 kg

Range:

> 20 kg

Range:

19. Please respond for CSTR - High pressure.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. Please respond for CSTR - High pressure.

< 1 kg

Range:

1 - 20 kg

Range:

> 20 kg

Range:

21. Do you make, design and modify your own continuous reactor setups?

☐ Yes

☐ No

Please specify reactor types you modify (e.g., plug flow reactor heated, packed-bed reactor).

22. What level of detail do you provide about your reactor design to your customers?

- ☐ Full P&ID (Process and Instrumentation Diagram)
- ☐ Simplified P&ID (Process and Instrumentation Diagram)
- ☐ Basic reactor dimensions and configuration
- ☐ No information provided

23. Do you have commercially available continuous reactor equipment? Please identify the equipment type (not to include makes and models) and at what scale of development they are used: < 1kg; 1 - 20 kg; > 20 kg

Type 1:

Type 2:

Type 3:

Type 4:

24. What types of pumps to you use?

25. What methods do you use to measure and control mass flow rates?

26. Do you have demonstrated use with high potency pharmaceutical compounds? If yes, please describe. Please include number of examples, number of runs, and threshold limits for exposure.

27. Comments on Section B: Equipment Experience - Continuous Reaction Infrastructure

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Section C: Supported Chemistries

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45%

28. Have you ever carried out any of the following reactions on a continuous basis? Please check as many boxes as needed.

	< 1 kg	1-100 kg	> 100 kg	GMP Experience
Photochemical Reactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrochemical Reactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ozonolysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General oxidations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fluorination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diazomethane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Azides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	< 1 kg	1-100 kg	> 100 kg	GMP Experience
Hydrazine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nitration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organolithiation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nitroalkane reactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CN (Strecker/Bucherer-Bergs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phosgene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ammonia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydroformylation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cabonylation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydrogenation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aerobic oxidation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cyclopropanation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grignard/Barbier reaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. List other continuous chemistries you've worked on and indicate as above:

- < 1 kg
- 1-100 kg
- > 100 kg
- G M P E x p e r i e n c e

Chemical transformation 1	<input type="text"/>
Chemical transformation 2	<input type="text"/>
Chemical transformation 3	<input type="text"/>

Chemical
transformation 4

30. Comments on Section C: Supported Chemistries

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Section D: Post Reaction Processing

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55%

Do you have continuous post-reaction processing capabilities in any the following area? When responding, use the following scale of 0-3 and select as many boxes per row as necessary.

0 = No capability

1 = Have capability

2 = Extensive Use (Used for at least 2 projects in last 3 years)

3 = GMP Qualified

31. Please respond for SMB Chromatography.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. Please respond for Continuous Separation and Extraction.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

33. Please respond for Continuous Distillation.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34. Please respond for Packed Column Scavenging.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

35. Please respond for Continuous Crystallizations.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

36. Comments on Post Reaction Processing Section

37. Please indicate the types of continuous filtration methods used.

Continuous filtration

1:

Continuous filtration

2:

Continuous filtration

3:

38. Please respond for your Continuous filtration method 1 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. Please respond for your Continuous filtration method 2 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

40. Please respond for your Continuous filtration method 3 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

41. Comments on Continuous filtration methods section.

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42. Please indicate the types of continuous drying method used.

Continuous drying
method 1:

--

Continuous drying
method 2:

--

Continuous drying
method 3:

--

43. Please respond for your Continuous drying method 1 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

44. Please respond for your Continuous drying method 2 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. Please respond for your Continuous drying method 3 using the 0-3 scale as above.

	0	1	2	3
< 1 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 - 20 kg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

> 20 kg

0

1

2

3

46. Comments on Continuous drying methods section

47. What is the largest number of unit operations that you have run sequentially as a continuous processing train?

10 g - 1 kg

Largest Number of Continuous Unit Operations (#)

< 1 kg

List example of sequential unit operation run in a processing train

1 - 20 kg

Largest Number of Continuous Unit Operations (#)

1 - 20 kg

List example of sequential unit operation run in a processing train

> 20 kg

Largest Number of Continuous Unit Operations (#)

> 20 kg

List example of sequential unit operation run in a processing train

48. What is your strategy on the use of surge tanks at the stable hold points? What is the desired surge tank capacity? 24 hours? 12 hours? Less? None?

49. Do you have any integration with drug product manufacturing operations?

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Section E: Analytical Capabilities

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64%

Please check if you have the following capabilities, using the following scale of 0-3.

0 = No capability

1 = Have capability

2 = Extensive Use (used for at least 2 projects in last 3 years)

3 = GMP Qualified

50.

Off-line or At-line (not coupled to process - manual sample retrieval)

Please check if you have the following capabilities using the above scale.

	0	1	2	3
Chromatography - HPLC/uPLC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chromatography - GC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - IR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	0	1	2	3
Spectroscopy - Raman	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - NMR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - UV/Vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Refractive Index	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Camera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - FBRM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Mass Spectrometry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - pH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (not listed)				
<div></div>				

51.

On-line/In-line (Coupled with process)**Please check if you have the following capabilities using the above scale.**

	0	1	2	3
Chromatography - HPLC/uPLC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chromatography - GC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - IR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - Raman	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - NMR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectroscopy - UV/Vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Refractive Index	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Camera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - FBRM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	0	1	2	3
Other - Mass Spectrometry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - pH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Process Temperature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other - Process Pressure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (not listed)				
<div></div>				

52. How are analytical methods integrated into process control?

	< 1 kg	1 - 100 kg	> 100 kg	GMP
For Information Only	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Approval for Forward Process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feedback Control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Real time Release Testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)				
<div></div>				

53. Comments on Section E: Analytical Capabilities

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Section F: Regulatory Interactions

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73%

54. Have you ever contributed to a regulatory filing on a continuous manufacturing process requiring the following?

	Yes	No
INDs	<input type="radio"/>	<input type="radio"/>
NDAAs	<input type="radio"/>	<input type="radio"/>
EOP2 Meeting	<input type="radio"/>	<input type="radio"/>
ANDAs	<input type="radio"/>	<input type="radio"/>
NDAAs	<input type="radio"/>	<input type="radio"/>

55. How do you define batch identity for your continuous processes?

56. How do you define batch history when feed materials are changing in the middle of a continuous “batch”?

57. How do you handle diverting flow during temporary process excursions when process parameters go outside of the range defined in the batch record?

58. Do you handle cleaning similar to existing cleaning procedures for pumps and process hoses? How do you verify the system is clean?

59. Do you have experience transferring any continuous process technologies to a Pharmaceutical company GMP manufacturing site? If so, please describe any differences from a traditional tech transfer.

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Section G: Issues Related to the Adoption of Continuous Manufacturing

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82%

60. Do you provide customers with a recommendation on whether a process should be done continuously?

☐ Yes

☐ No

61. What factors go into analyzing whether a process should be done continuously?

62. Over the past 5 years what percentage of your business has shifted from batch to continuous?

63. Over the next 15 years, what percentage of your business do you expect will shift from batch to continuous?

64. With regard to the previous question, are the barriers primarily technical or business challenges?

☐ Business

☐ Technical

Please provide any comment(s) you may have regarding the shift from batch to continuous and/or the primary barrier as indicated above.

65. What is your desired balance between developing processes for batch and then converting them over to continuous, versus designing for continuous processes from the beginning?

66. If the customer does not specify processing technology and you are a contract manufacturer, what circumstances prompt your consideration of continuous processing technologies?

67. Do you have any publications or publically disclosed presentations demonstrating your continuous processing and/or manufacturing experience? If so, please list.



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