Approach to enabling vaccine manufacturing ramp-up

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Importance of Ramping-Up vaccine manufacturing

Un-vaccinated people

- 7 times more likely to test positive
- 49 times more likely to be hospitalized
- 32 times more likely to die
Challenges with Ramping-Up vaccine manufacturing

Inherent Variances and Complexities that limit a quicker one size that fits all approach:

• **Vaccine types:** Live attenuated, Replicating vectors, Non-replicating viral vectors, Inactivated virus, Virus like particles, Subunit, Nucleic acid vaccines
• **Cell line:** CHO, VERO, Sf9 insect cells
• **Strategic considerations:** largely based on engineering triad limitations

![Diagram](image)

**Facility enhancement > Full customization**
except centrifugation and chromatography columns

**Repurposing existing facilities > retrofitting**
eexisting hardware/software with PAT, process sequence changes

**BZTRACKS** – Speed & Cost

**Green field facility > design and build in**
modular, semi-knocked-down architecture

**Smaller, more production plants**

**BOT with collaborative approach**

**Need based tailored customization:** Speed, Cost and Flexibility
Bioprocess Engineering Solutions

Facility Integration Services

Automation

Design & Build

Regulatory & Validation Services

Product

Process

Production Support
Automated Bioprocess Plants & Technologies
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Key Trends during Pandemic restrictions

- 24/7, 365 days
- 7 COVID vaccine manufacturers in 6 countries
- Supplied 179 equipment to Brazil, China, India, Middle East, South Korea, Switzerland and Thailand.
- Conducted physical Factory acceptance tests with 26 customer groups after implementing sanitized bubbles and daily RTPCR covid testing.
- Leveraged 360 degrees pan audio-visual technologies with 4k support to conduct 20 online tests
- Installed and commissioned 23 projects
- Executed every project on time and to quality

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