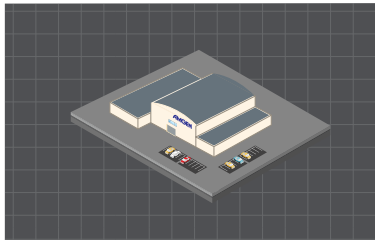
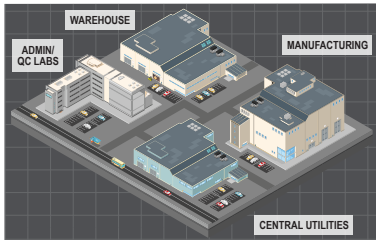


Transforming Biotechnology Manufacturing: Adapting Technology to a Changing Environment

In keeping with its history of manufacturing innovation and excellence, Amgen is leading the way in the development and use of manufacturing technologies that will set the standard for the future.

Conventional Facilities Future Facilities

Future Facilities Will Allow for Greater Productivity in a Smaller Footprint



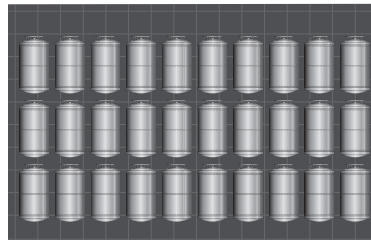
750K sq ft
Sits on **80 acres** across 3 buildings
Cost **\$1 billion** to build over **4 years**

Cost and footprint make geographic expansion difficult

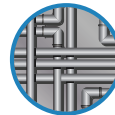
120k sq ft
Will sit on **5 acres**
1/5 of the cost and can be built in **2 years**^{1,2}

New facility allows **expansion** almost anywhere in the world to support **local market needs**

Reconfigurable Technology Allows for Greater Speed and Efficiency



Fixed stainless steel bioreactors
Ranging in size from **40 - 20,000 liters**



Complex network of piping to clean and sterilize between batches

Higher cellular productivity and cell densities result in smaller bioreactors and smaller plants



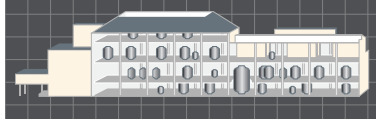
Single-use bioreactors
Maximum size of **2,000 liters each**³



Disposable plastic containers eliminate need for costly cleaning and sterilization

Streamlined Processes Result in Increased Flexibility

Complex, varied processes at different stages of drug development

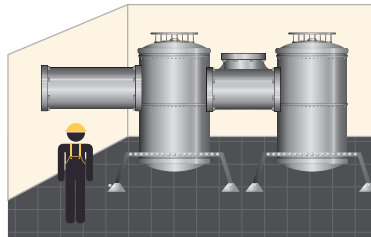


- Segregated operating suites** on multiple levels
- Discrete operational steps**, multiple transfers of drug material from place to place
- Time-consuming** quality analysis and control post-production

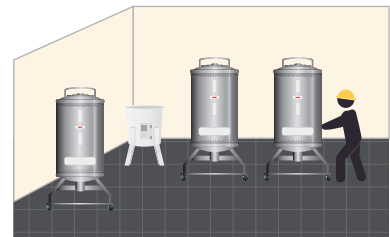
Standardized processes throughout development



- Single level** processing suite with **open floor plan**
- Connected, continuous** operational steps, fewer material transfers
- On-the-floor real-time quality analysis** and control allows product to be released faster



- Planned and built around **single products**
- Expensive**
- Time-consuming** to reconfigure



- Standardized, modular, and flexible design** makes it easier to reconfigure to produce different drugs or move from one plant to another
- Resulting continuous production allows for **reduced turnaround time** between batches⁴

Smaller, More Efficient Facilities Create Favorable Environmental Impact

Energy use decrease:
4-6x

Carbon emissions decrease*:
4-6x

Water use decrease:
10-12x

Solid waste generation decrease:
2-3x

*Carbon emissions are dependent on geographical location; in general, carbon emission reduction will mirror energy reduction.

References: ¹ Amgen Inc. "Amgen to Build State-of-the-Art Manufacturing Facility in Singapore." News release, January 16, 2013. ² Data on file, Amgen; 2014. ³ Whitford W, BioProcess International, 10(5)s Supplement May 2012. ⁴ Zheng R, BioProcess International, Supplement April 2010. ⁵ Data on file, Amgen; 2013.