Explaining **Expansion**

Eric Langer at BioPlan Associates, Inc analyses trends in capacity expansion in the US and Europe, and compares their predicted market growth

European biopharmaceutical manufacturers and contract manufacturing organisations (CMOs) are planning for significant capacity expansions, as much as 66 per cent for some systems, by 2012. Some areas of projected capacity increases in European biomanufacturing and contract manufacturing could outstrip US expansions by 30 per cent over the next four years.

These data, from the 5th Annual Report and Survey of Biopharmaceutical Manufacturing (1), are among many issues probed through an annual global study of 434 industry biomanufacturers and CMOs. One of the major findings was the five-year capacity expansion trend comparisons between US and Western European biomanufacturers.

To put the data in context, the annual report provides a composite view and trend analysis from biopharmaceutical manufacturers and contract manufacturing organisations in 32 countries. It covers manufacturing issues including: current capacity, future capacity constraints, expansions, use of disposables, trends and budgets in disposables, trends in downstream purification, quality management and control, hiring issues, employment and training.

PLANNED FUTURE CAPACITY EXPANSIONS: 2012

Survey respondents were asked to indicate how much their facility will increase production capacity overall by 2012. Figure 1 shows average projected capacity expansion from 2008 to 2012, and compares responses from Western European and US-based biomanufacturers and CMOs. Survey respondents in Western Europe expected strong capacity growth in virtually all areas, but especially in mammalian cell culture production and microbial fermentation production. The greatest average growth will be in mammalian cell culture systems. Here, respondents indicated an almost 30 per cent difference in projected growth, with five-year expansion plans calling for an average increase of 36.4 per cent in the US, versus 66.1 per cent in Europe.

For microbial fermentation, respondents indicated an average of 32.8 per cent in the US versus 44 per cent in Western Europe, an 11.2 per cent difference. Insect cell systems are expected to increase by just 34.7 per cent in the US, versus a total of 42.5 per cent in Europe over the next

Figure 1: Planned future capacity expansion: four-year estimates, 2008 through to 2012, US versus Western Europe

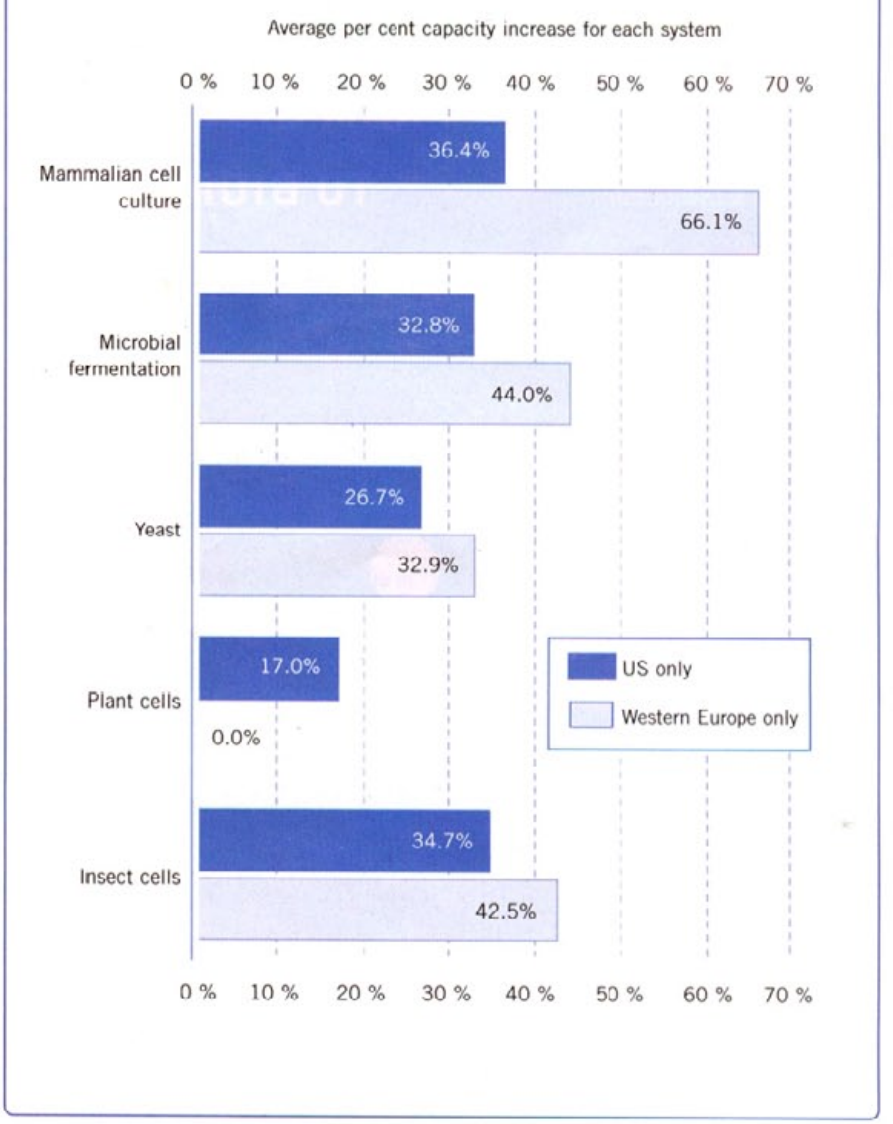
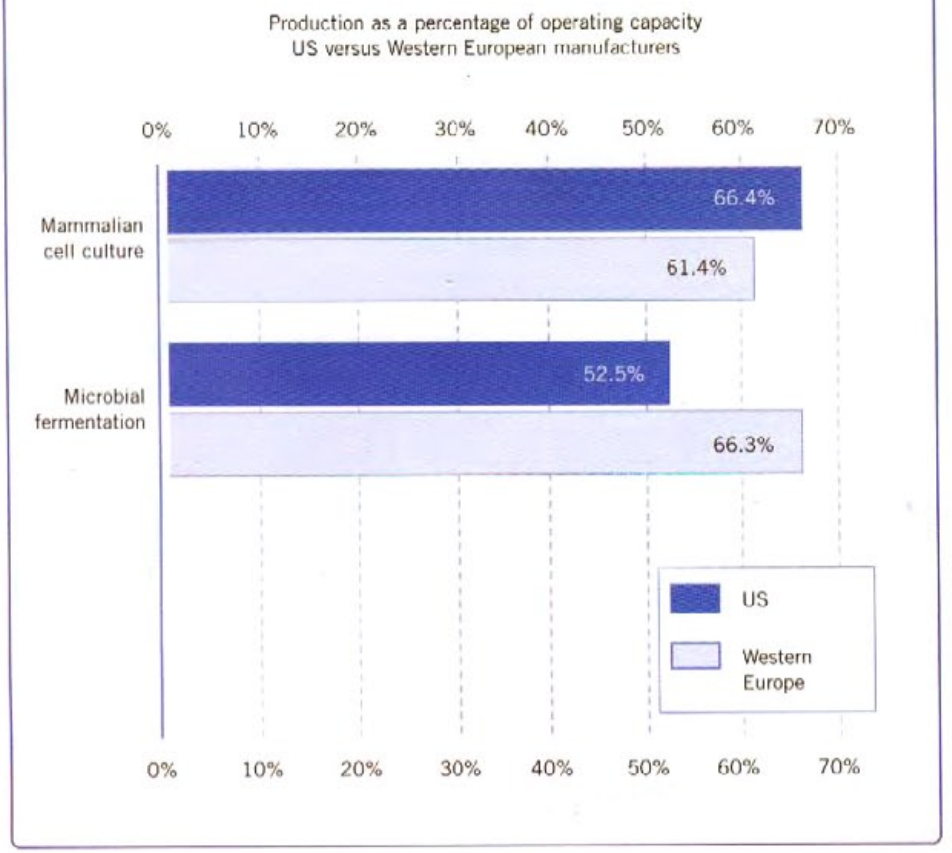


Figure 2: Capacity utilisation, by system, comparing US versus Western European biomanufacturers



five years. The only area where European biomanufacturers indicated no growth was for plant cell systems, compared with a 17 per cent projected expansion by US biomanufacturers.

Geoff Hodge, Vice President Process Development and Technology at Xcellerex Inc, suggests that the growth planned in Europe may correlate to overall expected growth of the biotech industry in both regions. However, he questions "whether this may suggest a net shift in transferring outsourcing overseas." Essentially, is it possible that some of the need for additional capacity in the US be met by outsourced production in Asia, for example, whereas European manufacturers might be planning to manage that need in-house? Capacity utilisation may provide a clue here.

CAPACITY UTILISATION: US VERSUS WESTERN EUROPEAN MANUFACTURERS

The average manufacturing capacity utilisation (per cent of total capacity at which a facility is currently operating), of companies in the US and Western Europe was compared. This demonstrated that while Mammalian Cell Culture saw a slightly higher capacity utilisation rate in the US (66.4 per cent versus 61.4 per cent in Europe), Microbial Fermentation was operating at a significantly higher rate in Europe (66.3 per cent versus 52.5 per cent in the US) (see Figure 2). This over-capacity in the US for microbial fermentation is likely to be part of the reason for the lower planned expansion over the next five years.

Worldwide, overall capacity utilisation for mammalian and microbial production continues to decline. There has, in fact, been a shift in mammalian capacity utilisation at CMOs compared with biotherapeutic developers. In 2007, for example, CMO mammalian capacity utilisation not only increased on 2006, it was also higher than the utilisation by biotherapeutic developers. This may be a result of two factors:

- Biotherapeutic developers have increased their mammalian capacity faster than they can fill it, and CMOs have filled their capacity faster than they are expanding it
- Biotherapeutic developers are outsourcing more of their mammalian production, thus using less of their available capacity and filling the CMO capacity

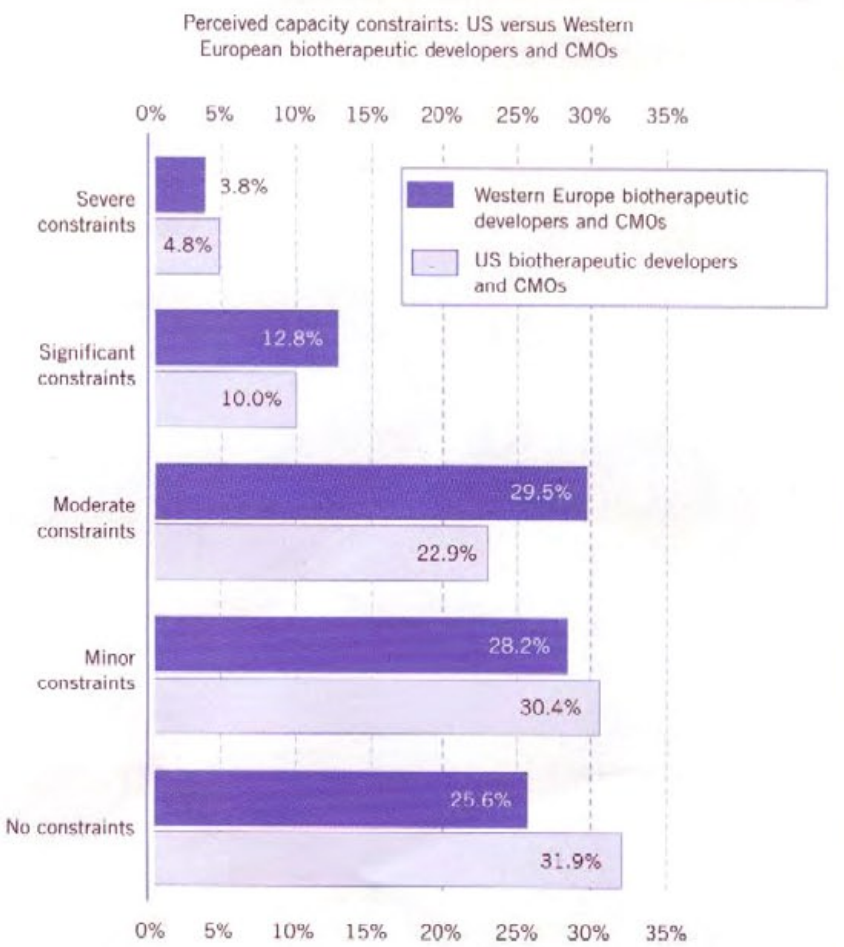
Microbial capacity utilisation, on the other hand, has declined significantly since 2006. There has been a drop of almost 10 per cent for biotherapeutic developers and almost 20 per cent for CMOs. This is likely to be the result of additional capacity coming online for both CMOs and biotherapeutic developers, which will take time to fill.

CAPACITY CONSTRAINTS: US VERSUS EUROPEAN BIOTHERAPEUTIC DEVELOPERS AND CMOs

Capacity expansion is, of course, driven by demand and constraints on existing capacity. European facilities are experiencing greater pressures.

Worldwide, overall capacity utilisation for mammalian and microbial production continues to decline. There has, in fact, been a shift in mammalian capacity utilisation at CMOs compared with biotherapeutic developers. In 2007, for example, CMO mammalian capacity utilisation not only increased on 2006, it was also higher than the utilisation by biotherapeutic developers.

Figure 3: Capacity constraints, US versus Europe



In the study, 74.4 per cent of Western European facilities indicated they were experiencing constraints to some degree, compared with 68.1 per cent of US respondents (see Figure 3). Furthermore, 16.6 per cent of European respondents felt that their constraints were either 'severe' or 'significant', compared to 14.8 per cent of US respondents.

FACTORS CREATING FUTURE CAPACITY CONSTRAINTS

Eighteen factors creating capacity constraints in biomanufacturing that may affect their organisation's production capacity over the next five years were evaluated. Globally, "physical capacity of downstream purification equipment" was indicated as the cause of the greatest future constraints (29.6 per cent). This was a shift from 2005 and 2006 when the "inability to hire new, experienced technical and production staff" topped the list.

US COMPARED WITH WESTERN EUROPE

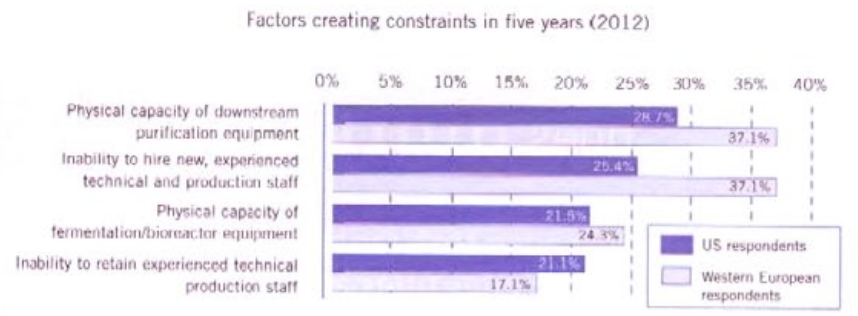
A comparison of responses from biotherapeutic manufacturers in the US and Western Europe showed there were significant differences in perception of how future factors may create capacity constraints by 2012 (see Figure 4). The greatest difference was seen in their perspective on hiring new, experienced technical and production staff. The inability to hire such staff was indicated by nearly 37.1 per cent of European facilities compared with 25.4 per cent of US respondents.

In Europe, lack of financing for production expansion would be causing relatively greater capacity problems (30 per cent in Europe versus 19.6 per cent in the US). Although Europeans are expecting physical capacity of downstream purification equipment to be a larger problem, both regions found this factor to be at the top of their list of factors creating capacity constraints in 2012. In addition, relatively fewer European facilities indicated that they are unlikely to see capacity constraints in 2012 (15.7 per cent in Europe versus 24.9 per cent in the US).

KEY AREAS TO ADDRESS TO AVOID FUTURE CAPACITY CONSTRAINTS

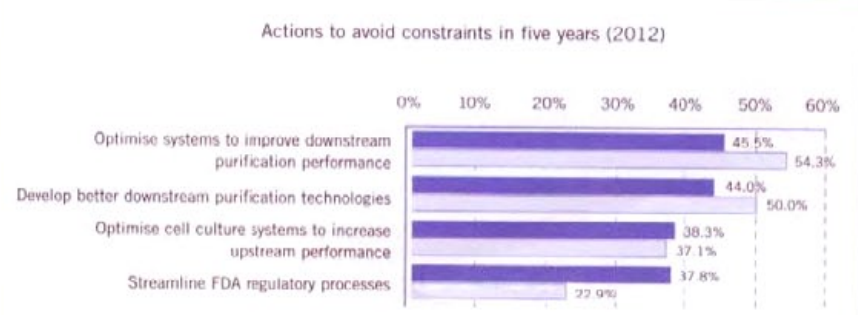
In addition to analysing the causes of capacity constraints, 20 actions that biomanufacturers should take to avoid capacity constraints were also examined. The areas that must be addressed in the future if the global industry is to avoid significant capacity constraints were again topped this year by, "optimised systems to improve downstream purification performance." This was also the top area in 2006, and took the second spot in 2005. Nearly half (45.5 per cent) of all respondents this year, 49.8 per cent of respondents in

Figure 4: Factors creating future capacity constraints, US versus Western European biomanufacturers



Note: Top 4 of 18 Factors Creating Capacity Constraints

Figure 5: Key areas to avoid capacity constraints, US versus Western European Biomanufacturers and CMOs



2006, and 44 per cent in 2005 indicated that this is an area to address in order to avoid capacity constraints.

US VERSUS EUROPEAN RESPONDENTS

Responses were compared with facilities in the US and Western Europe. The primary areas of differences in how capacity constraints can be avoided were: "streamline FDA regulatory process" where, not surprisingly, 37.4 per cent of US facilities indicated as a way to avoid constraints, versus 22.9 per cent in Europe. The other large discrepancy between the US and Europe was related to "funding more research to maximise production efficiencies." 25.6 per cent of US facilities indicated this as a way to avoid capacity constraints, whereas 40 per cent of European facilities agreed. Other areas of difference included "increase training and education in production areas"; "optimise systems to improve downstream purification performance"; and "establish manufacturing standards and industry benchmarking".

DOWNSTREAM CAPACITY CONSTRAINTS, US VERSUS WESTERN EUROPE

As noted, overall the greatest cause of capacity constraints in biopharmaceutical manufacturing, according to the study, involved downstream purification. Western European respondents were experiencing somewhat greater capacity constraints than US respondents in regards to purification. Comparing downstream elements, such as chromatography, depth filtration, and ultrafiltration among European respondents, 23.3 per cent felt that chromatography columns were causing significant or severe constraints, compared to only 18.7 per cent of US respondents. Similarly, a larger percentage of Western European respondents indicated that depth filtration was causing significant or severe constraints compared with US respondents.

CONCLUSION

Differences between how European and US biopharmaceutical manufacturers are experiencing constraints on their capacity are affecting production strategy. Plans for expansion in this industry require long-term horizons and substantial capital, facility and human resource investments. This study identifies trends associated with biopharmaceutical manufacturers, the systems in which products are manufactured, and the geographies in which they are produced. This information can be valuable when used as part of long-term production strategy planning.

About the author

Eric Langer has over 20 years' experience in biotechnology and life sciences management and market assessment. He is an experienced medical and biotechnology market publisher, practitioner, strategist, researcher and science writer. He has held senior management and marketing positions at biopharmaceutical supply companies, and teaches biotechnology marketing, marketing management, services marketing, and bioscience communication at Johns Hopkins University, and the American University, among others. He is co-founder and Managing Partner at BioPlan Associates Inc, and has a degree in Chemistry from the University of Maryland and a Masters in International Business from American University.
Email: elanger@bioplanassociates.com

Reference

1. *5th Annual Report and Survey of Biopharmaceutical Manufacturing*, BioPlan Associates, Inc