Manufacturing

What is Manufacturing?

Manufacturing is the third major stage in the value chain. It encompasses production of drugs and placebos for clinical trials (clinical lots manufacturing) as well as scaled-up production for drugs ready for the market. Like PD, a key aspect of pharmaceutical and biopharmaceutical manufacturing is the stringent regulations imposed by authorities on its execution, the facilities used and the workforce aptitude in manufacturing. There is certification known as the Good Manufacturing Practices (GMP) in the United States that firms must acquire in order to produce drugs.

Pharmaceutical and Biopharmaceutical manufacturing are fundamentally different in nature. The first stage of pharmaceutical manufacturing is known as chemical synthesis, whereby the active ingredient in the drug is created according to formula. It is tempered under controlled heat and temporal conditions that require strong supervisory skills. The active ingredient is then blended together with other chemicals to form the complete drug. These non-active chemicals, known sometimes as excipients are often procured from other chemical manufacturers. Biopharmaceutical manufacturing, however, involves cell-culture as its initial stage. The key ingredient in the drug in this case is the protein that is derived from cell-cultures that may be mammalian in nature, such as the Chinese hamster ovary (CHO) cells. The key requirement is to create a medium conducive to the culture of cells so as to induce them to produce proteins. In the second stage, the proteins or the active ingredients are purified. The series of processes for purification differ for pharmaceutical drugs and biopharmaceutical drugs. The post-purification process is known as formulation. The proteins or chemical mix are formulated into a form suitable for consumption. The subsequent stage involves dosage form production of the formulated drug. The end-products are then sent for packing, and suitable storage.

Trends in Manufacturing

As CROs get increasingly competent in executing clinical trials, PD ceases to become the bottleneck in the idea-to-drug process. The volume of activity thus shifts down to the manufacturing stage in the value chain. Pharmaceutical manufacturing is a fairly stable sector, with existing firms having sufficient, even excess capacity to manage the volume of new drugs for production. The same cannot be said for biopharmaceuticals. From 1982 to 1992, the FDA approved 31 biopharmaceutical drugs. The number of approvals rose to 110 in 1992 to 2002, an increase of more than 200%. Due to high capital outlays, the time required to gain FDA approval and build a manufacturing facility, and the impending expiry date of their patent, many biopharmaceutical firms are unable to take their drug into the manufacturing phase smoothly. Compounding matters, the manufacturing facilities and worker skill sets for traditional pharmaceuticals manufacturing is not readily interchangeable with that for biomanufacturing. This has led to the shortage in global biomanufacturing capacity. Studies predict a serious shortfall of nearly a million litres in bio-reactor capacity. This has opened the industry to the possibility of having a niche market in flexible contract biomanufacturers (CMOs).

Support Service for Manufacturing

The manufacture of excipients is one key external industry that plays an important role for traditional pharmaceutical manufacturing. Quality control and validation is usually conducted by in-house staff, although there is a possibility that such a role could be outsourced to firms with expertise in GMP regulations. Currently, there exist firms that specialize in developing platform (Novo Nordisk) as well as customized formulation technologies (Piedmont Pharmaceuticals) for both traditional pharmaceutical and biopharmaceutical manufacturing.

Manufacturing and North Carolina

The immediate number one priority listed by the North Carolina strategic plan for creating new jobs through biotechnology is to target biomanufacturing. In 2003, employment in this area was 4,400. When traditional pharmaceutical manufacturing is included, the number rises to 20,976. The growth rate in the manufacturing sector was 25% between 1993 and 2003. The real output level in 2003 was US$4.137 billion, and this has grown by 72% since 1993. The average wage per employee is US$ 48,000. North Carolina is also home to major biomanufacturing facilities. Biogen Idec in the Research Triangle Park (RTP) has built the world’s largest biomanufacturing facility with almost 90,000 litres of bioreactor capacity. RTP is also home to Dossynth RTP, formerly Covance, a CMO.