

Green Chemistry and Engineering Acts as the Key Driver of Sustainability in the Pharmaceutical Industry

Green way of thinking is directly linked to the economy

Orienting on the facets of Green Chemistry and Engineering, Director API-R&D, Dr Reddy's Laboratories, India, Dr Rakeshwar Bandichhor details why its practice is encouraging and elaborates the significance of academic-industry partnership for a healthy, innovative environment in the Indian pharma sector. Excerpts of the interview...



Source: Dr Reddy's Laboratories India

"Innovation through Green Chemistry and Engineering is bound to enable robust, scalable and safe processes."

Dr Rakeshwar Bandichhor, Director API-R&D, Dr Reddy's Laboratories, India

? *In order to encourage the integration of Green Chemistry and Engineering principles into the pharmaceutical industry, the American Chemical Society's (ACS) Green Chemistry Institute (GCI) Pharmaceutical Roundtable (PR) was set up around a decade ago. How do you perceive the contribution of global pharmaceutical companies till date towards meeting this objective?*

DR RAKESHWAR BANDICHHOR: ACS-GCI has pioneered the Green philosophy globally and promoted the application of Green Chemistry and Engineering in schools, colleges, universities and various industry segments since its inception. It undertakes work through different chapters and industry memberships, and also encourages training programs, workshops and Green Chemistry publications in the Organic Process Research and Development Journal on a regular basis. It also supports research grants to Green Chemistry-based proposals submitted by academicians across the world and disseminates valuable information on cutting-edge advancements in this area to the roundtable member companies. Most of these companies are on the track of institutionalizing and practising Green Chemistry and Engineering on a large scale. However, several medium- and small-scale enterprises are still not aware of the benefits that Green Chemistry can offer. The lack of knowledge on this can cause major setbacks to business prospects of such enterprises and even result in ecological imbalance, thereby impacting the entire society.

In the pharmaceutical industry, Green philosophy acts as the key driver of sustainability. Moreover, the challenges faced by this sector, irrespective of geographies and culture, are common. Therefore, I believe ACS-GCI serves as an interface where all the pharmaceutical

industries can work together towards attaining global sustainability and business profitability. Since Green Chemistry and Engineering is an emerging science, it will continue to evolve. So we need to follow the change and keep growing in business without compromising on the sustainability components.

? *Since Dr Reddy's Laboratories is an active member of ACS' GCI-PR, what initiatives are taken to drive Green Chemistry more enthusiastically in India?*

DR BANDICHHOR: Dr Reddy's commitment towards environment and sustainability is supplemented by objectives set by ACS-GCI. We promote and actively participate in GCI-related events. I believe ACS' GCI-PR is open to offer membership to deserving Indian industries. In India, it has already opened a chapter at the University of New Delhi to popularize the Green Chemistry and Engineering concept. It also works with Industrial Green Chemistry World and TATA Strategic Management Group to endorse and enable smooth conduct of the conference that is held every two years. Besides, training programs are offered to few schools, colleges, universities and IIT(s) in India. GCI is expanding its arm across India but there is a long way to go. The Indian chapter of American Chemical Society in collaboration with various Indian Chemistry Associations, which are set to open in Mumbai, will benefit Indian scientists. In addition, ACS membership to Indian scientists will be subsidized in due course.

? *Green Chemistry is a major determining factor in the process research and development arena in the pharma sector. How can the best be leveraged by deploying the same for driving cost-effectiveness and reducing waste?*

“We should focus on capability building through science and technology before we get into business trade-off. Considering the structural complexity of the upcoming molecules, it has become more important to venture into advanced level of research.”

Dr Rakeshwar Bandichhor



DR BANDICHHOR: Green Chemistry is the best possible way of practising chemistry without compromising on environmental factors. It ensures least Process Mass Intensity (PMI) or zero E-factor in the most atom-efficient and energy-efficient manner. Least PMI means maximum output at the expense of minimum input, which results in lowering of costs. This also allows to sync chemistry with engineering, thus ensuring speedy development of best quality products at the lowest cost. Last but not the least, this also helps to develop robust, scalable and safe processes. High costs incurred at every stage act as an area of concern in the production of pharmaceuticals. In order to reduce cost, en route, it would be feasible to safeguard the environment and become more sustainable as atom efficiency is increased and E-factor is minimized. Green philosophy fundamentally helps in developing affordable medicines for leading a healthy life.

? *From the pharmaceutical business perspective, what challenges does the industry face in terms of practising Green Chemistry?*

DR BANDICHHOR: Poor understanding of the distinctive advantages offered by Green Chemistry and Engineering acts as a deterrent in terms of practising greener alternatives in the pharmaceutical sector. Green Chemistry is not expensive, rather it is common sense based science. Even if companies realize this, it is a challenging task for them to find a profitable substitute as it requires high level of scientific domain knowledge to bring the solution on board. Green Chemistry and Engineering is believed to bring tangible benefits and aid capability-building; still it takes a backseat. I believe it is probably due to inadequate promotion by the chemistry fraternity and poor recognition given to Green Chemistry and Engi-

neering R&D efforts. Since this science has the potential to add high value to products, it is important to incentivize scientists, otherwise it would be difficult to keep the momentum going.

Often, Green Chemistry and Engineering strategies require investment at a scale which does not happen on time. This leads to poor business reflection from return on investment (ROI) standpoint. Moreover, first-in-market strategy calls for speedy product development, on-time delivery of solutions, protection of intellectual property rights etc. Striking balance between these requirements and Green Chemistry-based solutions imposes tough impediments. There is also the challenge related to supply chain partners, who should be cost driven to support businesses of big companies. They may do business due to fewer overheads, but their growth will suffer if they lack understanding and infrastructure to produce greener products or intermediates.

? *As the API-R&D department of your company is renowned for its cost-effective development of active pharmaceutical ingredients, how does your company see the role of innovation and research in today's market scenario?*

DR BANDICHHOR: Innovation provides distinctive advantage over others as it helps to understand the complexities involved in product development. Particularly, innovation through Green Chemistry and Engineering is bound to enable robust, scalable and safe processes. One of the essential components to derive high business value out of innovation is to collaborate and learn from global experts about dealing with problem areas based on their experiences. In essence, innovation leads to profitability and learnability that inspires further innovation and that's how the knowledge industry grows. This is important for survival.

? *Given the fact that research is the lifeline, do you think Indian academic institutions and R&D organizations support research in a large way?*

DR BANDICHHOR: Not only Indian academic institutions, there should be global academia-industry collaboration to foster the needs of society through science and technology. Industry scientists can help train the trainer (teachers) so that they and their students may get aligned with the industrial way of working. It is important to have effective networking through conferences. We should focus on capability building through science and technology before we get into business trade-off. Considering the structural complexity of the upcoming molecules, it has become more important to venture into an advanced level of research and development rather than depending upon old ways of practising science. This is where the academia-industry partnership can play a pivotal role. Industry-academia collaboration at every level of drug development can help fill the existing gaps and move towards sustainability, truly based on science and technology.

? *Please share your thoughts on how R&D in Indian pharma sector could be taken more seriously in terms of investments and opportunities.*

DR BANDICHHOR: Without innovation it would be difficult to survive in the Indian pharmaceutical industry. In order for innovation to continue, gradual huge investments are required. Such investments should aim at creation of state-of-the-art instrumentation facilities to conduct high-end research in India. We need to train our young generation to meet future R&D challenges. Success in the pharmaceutical sector requires a high degree of innovation and fundamental understanding of ways to connect science and technology to any business. Such kind of expertise that scientists gain over a period helps them to deliver innovative products to the society. In due course, they encourage fellow colleagues to pursue strategies for strengthening the scientific acumen for profitability and uplifting the society through scientific deliberations, which would be impossible without R&D investments. ●

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