

---

## Lupin: Background Of The Company

The company Lupin, is named after a flower and thus imbibes its traits of blooming with time and has had an ever expanding trade. The Lupin flower is known to nourish the land and flourish even on infertile lands therefore creating a strong motto and foundation for the company to stand on. The flower is known to have medicinal properties and also acts as substitute for food hence protecting life and fighting against the various factors that try to expend it.

Growth is one of the main mottos of the company. Growth in terms of not just in terms of economic welfare and globalization but in terms of adding to a social cause. This social cause being to create a healthy environment and to sustain life. The company has been in the field of production of fine chemicals-pharmaceuticals for over 46 years. They deal in generic medicines and it is an FD approved company. The market's supply chain is wide, hence they follow their motto, "We Build to Grow". The backbone of this company is entirely research based, they try to imbibe new projects one of them being the product I worked on during my industrial training period. The company has several branches all across the world, some of the major sectors being in South Africa, USA, Japan, Australia, Philippines and the Europe.

Lupin Limited is a Mumbai based pharmaceutical company, it was established in the year 1968 by Dr. Desh Bandhu Gupta who had a noble vision of creating a healthy and a safe environment for people. He was a profound professor at BITS Pilani and he used his life's experience to fight against the then prevalent diseases to make people's lives easier. He had a vision to create a healthy nation. 46 years from then Lupin now stands tall as it is one company that has been ever expanding. Lupin created the antidotes to certain diseases like Asthma, TB, Diabetes, Cardiovascular problems and NSAIDS and its medicines are available worldwide. It is currently the largest producer of anti-TB drugs.

The main vision of this company is "To be an Innovation led, transnational Pharmaceutical Company", and since their establishment they've been working towards the very same. They support and promote virtues that include Integrity, Teamwork a passion and drive for excellence followed by an entrepreneurial spirit- that is the ability to take initiatives and explore new avenues which also implies bringing about new organizational strategies.

Lupin believes in a quality-led manufacturing base and follows the policy that their customer is their very epicenter of business philosophy. Hence good manufacturing practices are another policy the company very closely follows. A global network of state-of-the-art manufacturing facilities has helped the company build up its scale and has enabled the company to meet customer needs.

With day to day advances in scientific and technological fields, the world of sciences has been expanding at a very fast pace. The drug development technology which is being embraced by pharmaceutical companies like Lupin majorly takes into consultation a combination of life sciences along with fields like biotechnology and medical technology. The industry makes use of latest technology both in terms of API (Active Pharmaceutical Ingredients) as well as production to therefore meet the market demand.

---

Research is not just in terms of formulations within a pharmaceutical company, from an engineering point of view-process development is also a very vast area of research. Each of the devices and operations carried out are meticulously planned by the process development department. Lupin's investment in research has paid off in terms of company establishment and product manufacturing strategies. The drugs that are made post production are sent to the quality testing area where the purity of the product is checked according to which the drug is released into the market or the batch is discarded. The investments made by a company in terms of research can be a huge risk factor as well, but Lupin still manages to take both the company's market value and its research sector hand in hand. With a team of 1700 scientists within India-Lupin is well on track to emerge as an innovation led transnational pharmaceutical powerhouse providing affordable healthcare solutions with uncompromising quality. Lupin has currently invested about 23,101 million worldwide, which is about 13.5% of their Global Revenue into research on certain products that are yet to be developed which can be used as a preventive drug against diseases that currently do not have a cure.

Their scientists work closely with the innovation as well as marketing team in order to develop medicines for a particular need assessment. Here the need being any sort of illness that obstructs a man's life or eats a huge chunk of it. The company therefore tries to fulfill people's social needs which can help them have a healthier life. Their objective is not just to meet market demands for generic medicines but also to attain high standards of manufacturing practices thereby giving their employees a good working experience.

The division under which my internship program took place was production and the plant allotted to me was MPP-7. Here in, MPP stands for a multi-purpose plant. That is, since the company Lupin majorly deals with generic medicines, the product to be produced changes as per market demand as well as research and development analysis. Moreover within a single plant it is noted that production of 6 different products take place out of which I was allotted the process study of Rano II and Rano Crude followed by a project on the very same. Rano II and Rano Crude here are two of the 8 stages in the production of Ranolazine. My project here was majorly based on investigation study on the two processes followed by a process optimization of the stage Rano II.

The division comprises of the plant manager, the plant in charge and officers that take in charge of shifts as well as smooth functioning of the production. Each plant has 2 safety incharges who are trained in case of emergencies to avoid fatalities. The division worked in a very disciplinary fashion and they were extremely helpful as I learnt a lot from this training program. This particular division had very strict safety protocols to be followed which was inclusive of a training system provided to the casuals before their tasks every day. Not just this, they were well aware of the environmental safety hazards hence the waste disposal mechanism was also safe and sound hence the training provided an overall experience of how an industry should be working.

My project is divided in two divisions majorly, one half of the training includes an investigation study of the entire process for Production of the products Rano II and Rano crude while the other half constitutes of a detailed study for improvement of solvent recovery in the stage Rano II. It was found through observation that the amount of solvent recovery for Cyclohexane is much lesser than any of the solvents used for the process. Hence process optimization of Rano II is a major part of my study in this report.

---

Since the problem area could have been wide, I decided to break down each segment of the process and study it closely. A detailed analysis of my project is provided in the following section. My industrial training began on 30th May, on the very first day it is necessary for one to know about their company and all their policies to do with your assigned designation and that of the people one would be working under. My training began with going through the company policies, thereby giving me an idea as to what is expected of me during my training program. After this, the next thing that was on the itinerary was an orientation program where the company's manufacturing practices were discussed. The term used for the same was Good Manufacturing Practices. Some of the main pointers of GMP here were pointed out and they are listed as follows:

1. The workers should be healthy- The health of your working staff is of utmost importance while you're working in a pharmaceutical company. This is inclusive of both the casuals as well as the officers, shift in charge as well as the people in the highest managerial posts within this company.
2. Government Inspections are performed on the company to check for any flaws in the practices followed by the company, hence all the scope for improvement is explored. Both internal as well as external audits are performed within the company for any incorrect practice followed by the practitioners.
3. Use of water purifiers within the company to avoid water borne diseases and hence aiding to employee welfare. Mosquito repellent and rat traps are used to avoid any pest infection within the company. Basically hygiene is not compromised upon at all.
4. PPEs are provided by the organization in order to aid safety of the employee. Followed by this session was a training session that enlightened us about the hazard faced by the company within the plant area and risk factor behind most tasks and the steps taken by the organization to make the working environment hospitable for the employees.

The activity that I was asked to work on during my industrial training was process optimization of Ranolazine 2 and study of the process and the equipment used in Ranolazine Crude. The activity majorly included increasing solvent recovery of Cyclohexane which was considerably low. To troubleshoot this particular system flaw, I began with utmost scratch and listed out the possibilities which in turn lead to a decrease in solvent recovery. Some of the possibilities I hereby listed were as follows:

1. Ineffective heat transfer because of which vaporization doesn't take place and match the theoretical value.
2. The impeller used for agitation is not efficient- it was observed that the raw material circulates only in between.
3. Inadequate power supplied because of which agitation does not take place hence leading upto inefficient heat transfer within the reactor system.
4. Condenser efficiency is less- this could be due to scaling or fouling.
5. Shell side area is less in the condenser or the number of tubes is inadequate.
6. The retention time within the reaction vessel is less.
7. The pressure temperature conditions need to be altered for optimum recovery.
8. The utility temperature used is not appropriate for the process. According to these above listed possibilities, on the basis of both observation as well as calculation, I've tried to obtain a solution to the same.

The officer who was assigned to me as a mentor was Abhijeet Sukhale. His designation being

---

the Plant manager for MPP-7. Here, MPP stands for a multipurpose plant. The same plant produces a number of products with respect to market requirement. He guided through my entire project, thereby helping me come to an approximate ultimatum regarding the very same.

I started my Industrial Training on May 30th and the training ended on July 13th. The duration for my internship period was 45 days where I was not just given a project but also given an opportunity to explore real time working scenario within a plant and I had the opportunity to be a part of several activities that took place as well.

My training period commenced with knowing the company and the job description provided to me. This gave me an idea of what exactly was expected of me during this time span followed by which we had a medical checkup which acts as the baseline data for the company employee/trainee. Based on the very same a medical report was made and forwarded. Right after this I was introduced to this particular section of the plant named Production, where I was provided with the title for my project and a run through of the same was conducted by me, equipment and devices I had theoretical knowledge about were introduced to me. My topic for the project was Production of Ranolazine and process optimization which included maximizing solvent recovery for this particular project. To understand the process further I made several simpler calculations like material balances and pump NPSH calculations with the help of the data provided and the Perry's Handbook.

Alongside this other duty assigned to me include making safety reports for the plant on the incidents that had taken place. This task included HAZOP analysis as well which thereby integrates the subject Process safety. This particular task gave me an insight of how important safety is during plant operational hours.

This industrial training has given a lot to take back with me while I return to the university, real time problem solving is one area that a process engineer needs to have expertise in. The company was much co-operative in providing a healthy learning atmosphere for me as a trainee.