CHAPTER 1

OVERVIEW OF PRESENT WORK

1.1 JUSTIFICATION FOR THE NECESSITY OF PRESENT WORK

Globalization of economic activities has been one of the most important and dynamic change in the Indian business environment. Globalization’s greatest impact has been on the manufacturing environment. The old concepts and methods of manufacturing are rapidly becoming out of date all over the world. Further in this era of global economy, India can not isolate itself from the worldwide forces of competition. In order to match competition Indian industries will have to rely more heavily on advanced manufacturing systems. Robotics is one of the advanced manufacturing systems that offers opportunities to improve productivity, flexibility, and product quality.

Robotic systems have already established their permanent place in the manufacturing industries of developed countries. However, Indian small and medium sized industries, which in past have developed their production processes through hard work and experience, have failed to utilize multifunctional machines like robotic system. This is primarily because of lack of planning, improper implementation principles followed and inaccurate economic evaluation of robotic applications.

One of the major problems with implementation of robotic system, in Indian industries lies in the simple fact that it is still new. Unlike, conventional manufacturing system, whose impact was limited to shopfloor, robotic system affects every aspect of an organization. Hence, implementing robotic system is far more complex than conventional manufacturing system. At the same time most of the literature available on implementation of robotic system is related to the state of art of the industries of developed countries, subjective and exists in isolation. Consequently, this work aims at analysing literature on the various aspects of implementation of robotic system and developing a fairly generalized computer aided methodology for implementation of robotic system in Indian industries.

1.2 METHODOLOGY FOR IMPLEMENTATION OF ROBOTIC SYSTEM

The developed methodology addresses and analyses the following issues.

1. Robotic implementation planning.
2. Financial justification of robotic system.
3. Robot work station safety.

1.2.1 Robotic Implementation Planning

Robotic implementation planning methodology is developed by evaluation of the following individual steps.

1. Plant survey for possible robot applications.
2. Selection of application.
4. Selection of vendor.
5. Robot work cell design.

The developed methodology is used to demonstrate the technical feasibility of implementation of robotic system in Bakeman's biscuit manufacturing plant, Nagpur.

1.2.2 Financial Justification

Financial justification is perceived to be a decisive factor in the market success of the robotic system. But the main problem is quantification of costs, benefits, and strategic values of the investment in robotic system. This problem is yet to be resolved by accounting or other procedures. Under such circumstances a combination of qualitative and quantitative analysis appears to be the best possible solution. Accordingly, for quantitative analysis of costs and benefits of robotic system, Net Present Value (NPV), Payback Period, Benefit Cost Ratio (BCR) is suggested. It is not always possible to accurately predict all the costs and benefits associated with robotic system, this makes it necessary to perform the sensitivity analysis. Incorporation of sensitivity analysis helps in locating the gray areas in the analysis. For economic analysis of robotization a software ECOROB has been developed. The developed software also provides for sensitivity analysis. Qualitative analysis can be very useful to analyse the long term strategic issues and non monetary factors relating to decision of implementation of robotic system. Analytical Hierarchy Process (AHP) provides a useful tool for quantitative analysis of qualitative issues. In this work, Saaty's time dependent analytical hierarchy process is proposed to integrate the qualitative and quantitative analysis. This methodology has been programmed to make the justification process fast and accurate. All the features of the developed softwares are demonstrated through a prototype example. Financial viability of the implementation of robotic system in Bakeman's biscuit plant is assessed through the developed softwares.

1.2.3 Robot Work-Station Safety

An extremely important human factors issue while implementing the robots in the manufacturing system is to provide a safe working environment for the workers and the individuals who are affected by the robotic system. Keeping this important aspect in mind a generalized safety procedure is developed for robot work-station safety. In order to provide expertise at crucial decision points and to reduce the complexity and risks associated with robot work-station operations, a knowledge-based expert system for robot work-station safety is also developed.