ABSTRACT

With growing awareness of environmental issues – from global warming to local waste disposal and pollution problems – business and government have come under increasing pressure to reduce the environmental impacts involved in the production and consumption of goods and services. However, organizations consider environmental assessment fairly late in the product development process, which generates additional design constraints and increases the development costs. The existing paradigm of product development towards low cost and high profits is unlikely to change significantly as organizations have to make profits for their existence. However, the integration of environmental requirements through life-cycle stages of a product is a likely approach, leading to a new paradigm of environmentally conscious manufacturing (ECM). ECM is concerned with developing methods for designing and manufacturing of new products from conceptual design to final delivery, and ultimately to the end-of-life disposal in an environment friendly manner.

The lack of performance measures for ECM has been pointed out as the single largest problem in implementation of environmentally conscious manufacturing. Because of the lack of ECM performance measures, judgments about ECM become costs in ethical or moral terms. Therefore, there is a strong need to develop performance measures for environmentally conscious manufacturing so that these systems/practices can be evaluated and justified for either continuous improvement or implementation.

In this thesis, performance measures for environmentally conscious manufacturing has been developed based on the review of 78 research papers/articles. A survey of 285 industries in India, using a questionnaire specifically developed for this study, has been done to validate the developed performance measures. The developed performance measures have been found to be highly reliable using Cronbach’s alpha. High correlation has been demonstrated among the variables defining the scope and contents of the performance measures by using Pearson correlation coefficient, Barlett’s test of sphericity, and KMO measures. The validity of the performance measures has been assessed through factor analysis by using SPSS for window® statistical tool. Further, the data has been analyzed separately for tiny/micro, small and medium, and large enterprises and found to be statistically reliable and valid.