CHAPTER 8

CONCLUSIONS AND FUTURE SCOPE
8.1 Conclusions

This research is an attempt to achieve world class manufacturing approach in small and medium scale printing industry. In the present work, parametric analysis of offset printing process has been done based on Design Of Experiments method. Experiments were conducted to develop empirical models of the process. Process optimization was then performed using Genetic Algorithms (GA). Following conclusions can be drawn from the analysis of the results:

1. From the preliminary experiments it was found that the surface temperature of the rotating roller from which the ink finally transfers from inking system to the plate cylinder is the dominating parameter affecting the print quality.

2. Experiments were conducted as per the optimal combination. Increase in surface temperature of rotating roller affects the balance of ink film thickness, increases the ink consumption and deteriorates print quality.

3. World Class Quality Aspect: Quality Aspect at world class level Print density achieved under temperature controlled condition is closer to the target densities as shown in Table 8.1

<table>
<thead>
<tr>
<th>TYPES OFFSET MACHINE</th>
<th>BLACK Density</th>
<th>CYAN Density</th>
<th>MAGENTA Density</th>
<th>YELLOW Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET- FEED, GRACOL Standard from America</td>
<td>1.4-1.5</td>
<td>1.35-1.45</td>
<td>1.35-1.45</td>
<td>0.9-1.1</td>
</tr>
<tr>
<td>Avg. Values Obtained on Graphtica 771 m/c With Chilling for 500 samples with subgroups size 10 samples.</td>
<td>1.45</td>
<td>1.35</td>
<td>1.36</td>
<td>0.9</td>
</tr>
<tr>
<td>Avg. Values Obtained on Graphtica 771 m/c Without Chilling for 500 samples with n=10</td>
<td>1.68</td>
<td>1.52</td>
<td>1.50</td>
<td>1.2</td>
</tr>
</tbody>
</table>
4. **Productivity Improvement:** With modification of the process parameter and design of components, IPH operating range has increased from 3500 to 4000 which has resulted in productivity improvement per batch by 14.58% and higher output results in less frequent blanket washes which avoids scumming and maintenance is minimized.

5. **Eco-Friendly Aspect:** Using Single-objective optimization by GA revealed that use of modified surface temperature at moderate speed eliminates the use of Isopropyl alcohol in fountain solution which prevents unhygienic environment and making the process eco-friendly, minimizes solid waste.

6. **Ergonomic Aspect:** Water cooled roller system is designed to eliminate the manual control of regulating dampening system accounting ergonomic consideration.

7. **Consumption Cost Reduction:** The inking unit temperature control device provides a constant temperature in the inking unit. Thus increase the process stability and it reduces the start-up time by 8 to 10% and less waste sheets at the beginning which causes saving from 5 to 8%. Ink Cost Consumption is reduced up to 5 to 6%.

**8.2 SCOPE FOR FUTURE WORK**

The current work suggests some of the feasible extensions to the present work. Some of them are listed below:

1. The current work was done using roller modification of inking system of offset machine. It would be interesting to analyze the process performance within the ink feed system of other printing processes like Gravure Printing, Flexographic printing.

2. A mechatronics system needs to be developed so as to control the flow of chilling system

3. Further, it is interesting to study the fluid dynamics of the penetration of the ink on the substrate.

4. Scope exists for theoretical modeling and process simulation in proofing system of offset machine which gives printing samples prior to actual printing.

5. Critical analysis of performance measure and process can be used for machine tools used in small and medium scale industries.