CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

Various influencing factors affecting the toner charge-to-mass ratio (q/m) of the two-component developer were investigated. These factors were the mixing force, the toner concentration (wt%), the toner shape, and the carrier type. The toner q/m values on the developing unit of the OKI 400 micro line CL Printer were analyzed. The print qualities were focused by measuring the solid density, densities at 60 and 40% halftones, and background density of the print-outs with a test form by a densitometer. The edge sharpness and edge raggedness of the characters were analyzed by the image analyzer.

Conclusion

It was found that the following parameters, (1) the mixing force, (2) the toner concentration (wt%), (3) the shape of toner, and (4) the carrier type affected the toner charge-to-mass ratios (q/m). The electric force (F_E) and the friction force, which occurred between the photoconductor (PC) and the developing roller also affected the q/m values in the same manner. The densities, the edge sharpness, and the edge raggedness of the character were analyzed for the print qualities.

First, an increase in the mixing force lead to more contact areas and forces between the toners and the carriers. This effect led to an increase in the toner q/m values. For the higher mixing forces; the toners were crushed with the carriers and lead to lower q/m ratios. Second, the lower toner concentrations gave higher q/m values than the higher toner concentration. The coverage on the carrier surface of the toners accommodated more than one-layer when increasing the toner concentration. The toners at the second-layer could not be charged, so the q/m values were lower. Third, the toner shape controls the amount of contact sites on the toner surface. The spherical-shaped surface had more contact areas than the irregular-shaped surface. This led to an increase in the charging rate, so the q/m values were higher. Fourth, the

carrier type also influenced the q/m values, the steel carrier (TSV-200) surface charging ability had strong tribocharging points more than those of the ferrite carrier (F-200). As this result, the steel carrier gave the higher q/m values. On measuring various currents of the carrier surface, it was found that an increase in the current resulted in an increase in the q/m values.

The toner concentration between 3 and 7 wt% together with the mixing speed between 600 and 1000 rpm, spherical-shaped toner, and steel carrier with high current were considered as the most suitable measuring condition, which led to high q/m values. Interestingly, the q/m value of the printer, (OKI 400 micro line CL Printer) depends on the electric force (F_E) and friction force between the PC drum and the developing roller. At higher exposure, the q/m values "On the PC" were higher than that of "Before transferring to PC". The q/m values of N-09S toner were higher than the KT-16a toner. On the contrary, the q/m values for each toner were close value. At 100% exposure, all of toners were transferred onto the PC drum. Electric and friction forces for the toner movements were quite strong. As the results, the q/m value was higher than the other exposures. The print qualities were measured by the solid density, the densities at 60 and 40% halftones, and background density of the print-outs. The solid density and background density of two toners, N-09S toner and KT-16a toner, had similar values. For 60 and 40% halftones, the density values of N-O9S toner were higher than those of the KT-16a toner. The spherical-shaped toner was more efficiently charged than the irregular-shaped toner, then the q/m value was higher. Therefore, the q/m values influenced the print quality. For the coverage of the toners on the lines and the characters on the paper surface, the N-O9S toned images were sharper and smoother than those of the KT-16a toner. Additionally, the background fog and the edge raggedness of the KT-16a toned images were higher than the other.

Suggestions

The other parameters that have effects on the charge-to-mass ratios were not investigated in this thesis. Example of these parameters includes the humidity effect on charge control agent (CCA) of the toner and the polymer coated surface of the

carrier. Besides, other charging mechanisms, which also impose effects on the q/m ratios have not yet studied. The above parameters are interesting and should be investigated further.