COMPARATIVE PRINT DEFECTS ANALYSIS OF LIQUID ELECTRO-PHOTOGRAPHY (LEP) AND DRY ELECTRO-PHOTOGRAPHY (DEP) PRESSES ON CELLULOSIC SUBSTRATES

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ABSTRACT

The print quality has been a point of major concern among digital presses. Digital presses are widely used due to their high productivity, versatility, and ability to print variable data. Electro-photography has come to exist with two major inking technologies i.e. dry form and liquid form of toner. The present study focuses on quantification of printing defects in liquid toner and dry toner electrophotography presses on cellulosic substrates and comparing the same. With the results it was found that at one hand paper moisture, mis-feed, ink drop out and warming up are major printing defects in DEP, on the other print quality issue, paper jamming, oil dripping, bid engaged / dis-engaged, registration out are major printing defects in LEP presses. This research paper highlights the importance of selecting the right digital press technology for printing on cellulosic substrates to avoid the printing defects.

Keywords: Digital Press, Electrophotography, Dry Toner, Liquid Toner, Cellulosic Substrate, Printing Defects

INTRODUCTION

Digital printing has revolutionized the industry by providing personalized data advantages and short run benefits. The two primary types of digital presses are liquid toner electrophotography and dry toner electrophotography, and digital printing technology has improved dramatically in recent years [1].

While liquid toner electrophotography employs a liquid toner that is electrostatically charged and applied to the substrate, dry toner electrophotography uses a dry powder that is melted onto the substrate using heat and pressure. The type of toner used has an impact on the printing process's print quality, robustness, and environmental impact [2].

On cellulosic substrates, which are frequently used in the packaging business, we compare the print defects of dry and liquid toner electrophotography digital presses in this study. The porosity structure of cellulosic substrates makes printing on them difficult because it interferes with ink absorption and adherence [3].

RESEARCH OBJECTIVE

Xerographic printing has gained popularity as a personalised printing method for paper substrates. Although waste and preparation time are minimal in xerographic printing, productivity, routine maintenance, and equipment reliability are the issues that most printers are concerned about.

Inking units are offered in two types for Xerographic printing: dry and liquid. Ink is provided in two different forms: dry powder form for DEP and liquid form for LEP. Electro Ink (Liquid Electrophotography, or LEP) is a liquid ink that is used with HP (Hewlett-Packard) digital presses. HP Electro-ink has extremely small particles, 1-2 microns, which are smaller than those of dry toners. Researchers have plenty of time to evaluate both EP technologies and draw comparisons between them. This research project's goal is to:

1. To evaluate and contrast the DEP and LEP presses' inking technologies.

2. To assess the printing flaws between LEP and DEP presses

RESEARCH METHODOLOGY

The project work was completed at Hisar industrial area on DEP and LEP digital printing presses. The technological comparison was made with the help of observation of printing defects in DEP and LEP presses. The print defect data was collected by observation method. Hp Indigo 12000 HD was used in research as LEP and RICOH Pro 8100 SE was used as DEP presses.

DATA COLLECTION AND ANALYSIS

Table.1. Printing defects data of Dry Electro-photography (DEP) press for the days 1-15

DAY	Paper moisture	Technical fault	Mis-feed	Blank page	Paper curl	Paper skew	Ink Drop out	Custom paper	Paper swing	Warming up
Day 1	38	3	30	6	5	2	19	4	4	32
Day 2	36	5	22	5	3	5	25	6	4	37
Day 3	48	6	39	5	3	4	30	4	6	36
Day 4	47	5	48	7	3	5	32	4	5	58
Day 5	49	6	50	3	4	5	36	5	1	47
Day 6	38	5	44	3	8	8	34	10	15	46
Day 7	53	9	37	5	2	3	22	7	6	50
Day 8	52	9	30	6	5	7	43	7	7	48
Day 9	36	11	62	6	5	4	47	5	5	44
Day 10	61	18	59	9	7	12	47	13	14	49
Day 11	45	25	36	13	15	13	62	17	14	56
Day 12	45	25	36	13	15	13	62	17	14	56
Day 13	42	9	51	8	6	7	50	26	8	43
Day 14	42	12	46	10	8	15	30	20	6	23

Day 15	42	18	56	11	14	8	22	14	17	45
Total	**674**	**166**	**646**	**110**	**103**	**111**	**561**	**159**	**126**	**670**

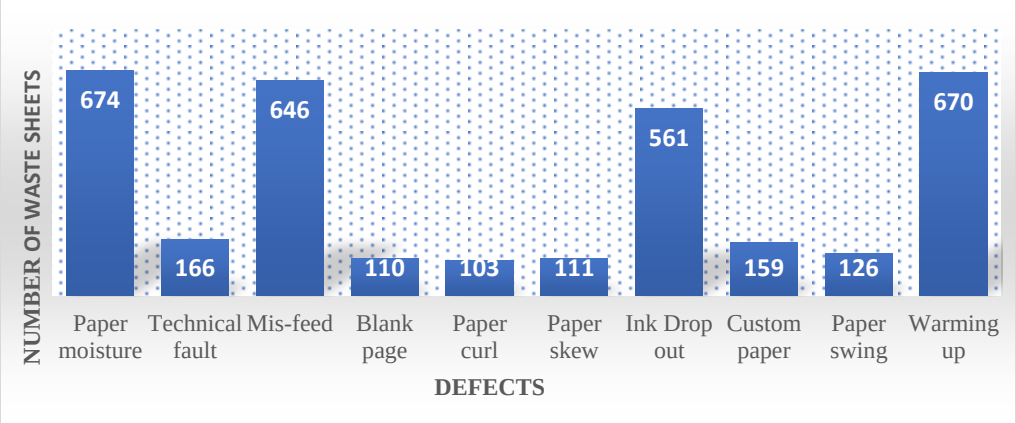

Fig.1. Printing defects analysis of Dry Electro-photography (DEP) press for the days 1-15

Table 2. Printing defects data of DEP for the days 16-30

DAY	Paper moisture	Technical fault	Mis-feed	Blank page	Paper curl	Paper skew	Ink Drop out	Custom paper	Paper swing	Warming up
Day 16	45	7	36	7	7	3	15	8	5	19
Day 17	29	9	26	8	8	3	23	4	9	22
Day 18	54	5	27	9	6	14	41	7	4	43
Day 19	52	8	52	9	13	9	48	9	11	53
Day 20	61	10	41	7	6	8	34	10	3	57
Day 21	48	14	45	5	10	13	41	7	18	49
Day 22	67	15	56	12	5	5	24	11	9	46
Day 23	62	13	51	13	1	11	49	9	9	58
Day 24	41	18	65	9	8	14	51	6	7	38
Day 25	47	10	69	13	8	16	43	13	21	41
Day 26	45	25	46	18	21	9	58	21	19	76
Day 27	50	9	32	11	9	5	23	10	5	26
Day 28	42	13	57	6	4	5	40	19	11	47
Day 29	48	15	52	13	7	10	26	21	9	24
Day 30	38	16	49	9	12	9	20	14	13	41
Total	**729**	**187**	**704**	**149**	**125**	**134**	**536**	**169**	**153**	**640**

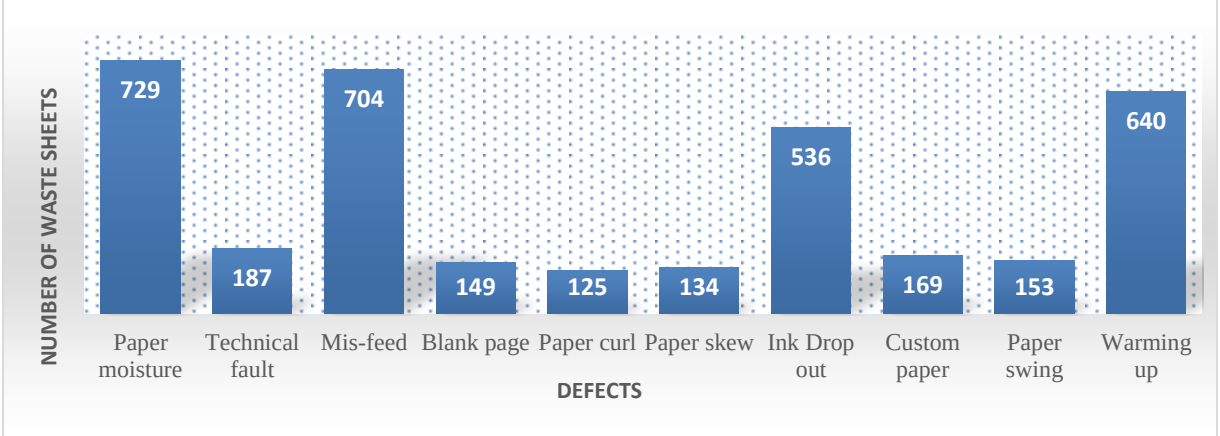

Figure 2. Printing defects analysis of DEP for the days16-30

Table 3. Printing defects data of LEP for the days 1-15

DAY	Paper Quality issue	Scratch	Paper Jamming	Image Placement Out	Oil Dripping	Scan band	Bid Engaged/ Disengaged	Wrinkle	Registration Out	Ripping/ Banding Problem
Day 1	48	6	51	10	46	0	29	2	41	0
Day 2	82	20	49	39	100	20	48	7	53	1
Day 3	87	24	53	19	90	15	61	9	79	2
Day 4	83	43	77	24	94	25	109	23	149	8
Day 5	117	10	79	22	119	6	79	22	144	9
Day 6	125	5	81	7	60	0	72	8	135	0
Day 7	121	11	73	13	87	6	79	16	79	3
Day 8	82	4	74	14	83	4	67	9	90	3
Day 9	74	14	89	16	0	82	76	16	81	10
Day 10	77	17	82	8	0	7	66	9	136	5
Day 11	33	5	36	2	28	18	39	12	27	15
Day 12	42	11	55	11	24	24	49	18	21	9
Day 13	31	7	17	30	35	19	45	5	46	7
Day 14	34	5	39	14	35	6	26	6	41	6
Day 15	41	9	33	12	49	7	12	7	35	7
Total	**1077**	**191**	**888**	**241**	**850**	**239**	**857**	**169**	**1157**	**85**

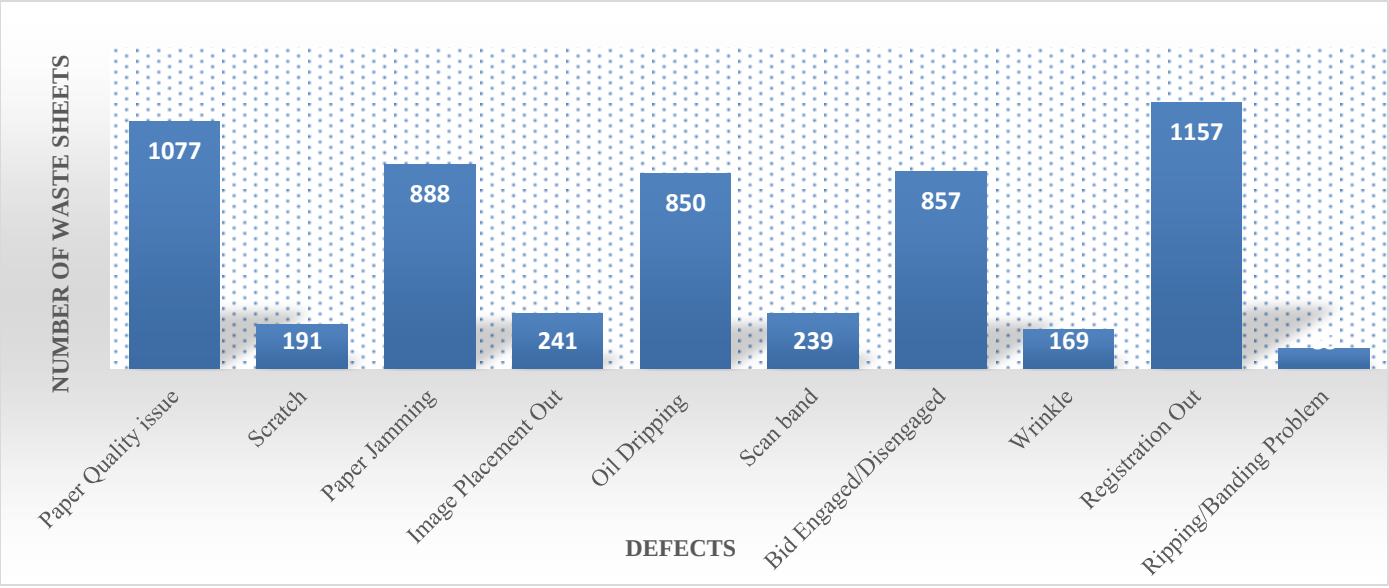

Figure 4. Printing defects analysis of LEP for the days 1-15

Table 4. Printing defects data of LEP for the days 16-30

DAY	Paper Quality issue	Scratch	Paper Jamming	Image Placement Out	Oil Dripping	Scan band	Bid Engaged/ Disengaged	Wrinkle	Registration Out	Ripping/ Banding Problem
Day 16	32	6	25	14	35	6	33	5	7	8
Day 17	40	8	36	7	35	4	46	4	34	6
Day 18	39	4	44	4	46	3	45	5	36	3
Day 19	41	7	44	4	34	3	38	3	43	7
Day 20	66	14	41	7	37	1	49	3	52	3
Day 21	49	3	47	4	55	5	63	3	46	4
Day 22	49	4	43	3	59	4	47	3	50	3
Day 23	57	8	48	12	39	3	59	4	58	3
Day 24	36	5	65	6	41	6	49	4	54	6
Day 25	84	7	62	4	57	5	65	4	45	8
Day 26	48	4	57	7	60	6	68	12	57	7
Day 27	49	4	59	6	75	8	79	7	69	5
Day 28	31	3	64	7	78	6	60	7	71	7
Day 29	52	4	50	5	54	5	57	4	61	4
Day 30	45	6	51	6	44	2	68	6	33	12
Total	**718**	**87**	**736**	**96**	**749**	**67**	**826**	**74**	**716**	**86**

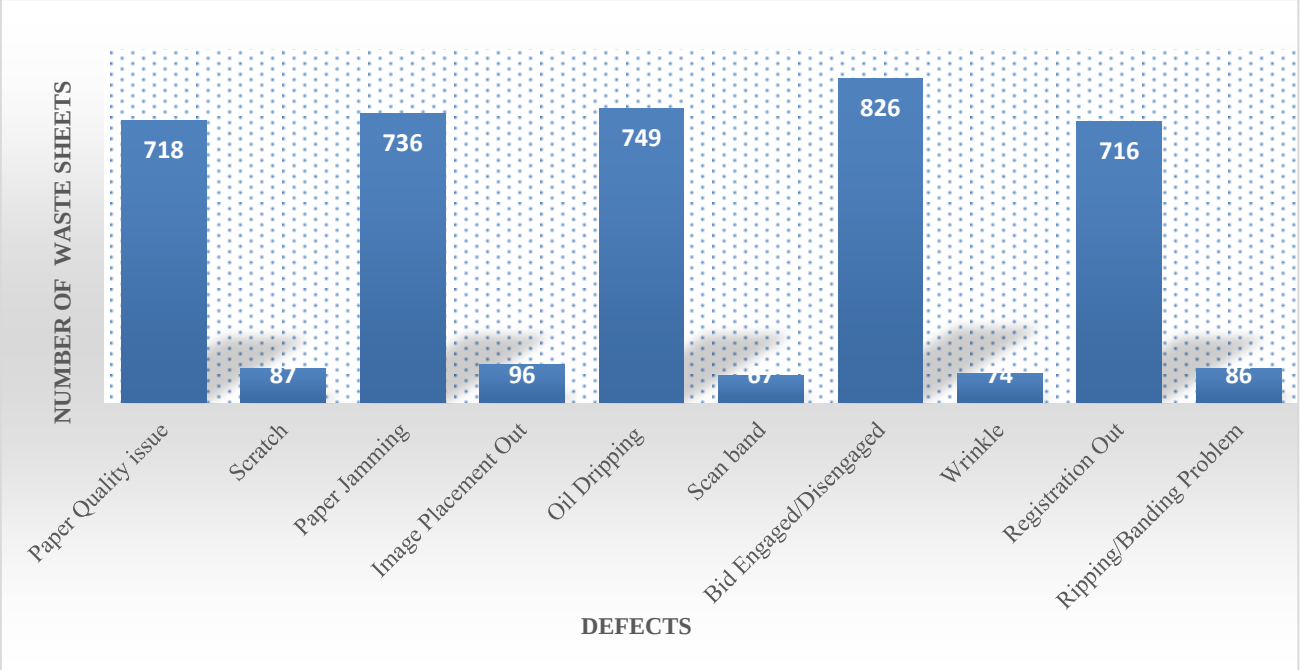

Figure 5. Printing defects analysis of LEP for the days 16-30

RESULT AND DISCUSSION

Figure 1 shows the data of days 1 to 15 of dry toner electrophotography digital press which contain: horizontally it shows that printing defects in DEP are such as paper moisture, technical fault, mis feed, blank page, paper curl, paper skew, ink drop out, custom paper, paper swing and warming up etc. Vertically it shows that number of waste sheets are 674, 166, 646, 110, 103,111, 561, 159, 126 & 670 respectively. From the given graph, it is figured out that number of wastage of sheets is higher in the defects are paper moisture, mis-feed, ink drop out and warming up. Due to these all defects, the sheet wastage is 4,155.

Figure 2 shows a total of 3526 sheets were rejected in the cycle of Day 16 to 30 of dry toner electro photography press which contains: Horizontally shows that defects are such as paper moisture, technical fault, mis feed, blank page, paper curl, paper skew, ink drop out, custom paper, paper swing and warming up. Vertically shows that Number of Waste sheets are 729, 187, 704, 149, 125, 134, 536, 169, 153, 640 respectively. From the given graph, we figured out that number of wastage of sheets is higher In the defects are Paper moisture, Mis-feed, Ink Drop Out and Warming Up.

Figure 3 shows a total of 5754 sheets were rejected in the cycle of Day 1 to 15 of Liquid toner electro photography press which contains: Horizontally it shows that defects such as print quality issue, scratch, paper jamming, image placement out, oil dripping, scan band, bid engaged/disengaged, wrinkle, registration out and ripping. Vertically shows the number of waste sheet such as 1077, 191, 888, 241, 850, 239, 857, 169, 1157 and 85 respectively. From the given graph, we figured out that number of wastage of sheets is higher in the defects are Print Quality issue, Paper Jamming, Oil dripping, Bid engaged / dis-engaged, Registration out.

Figure 4 shows a total of 4155 sheets were rejected in the cycle of Day 16 to 30 of Liquid toner electro photography press which contains: Horizontally it shows that defects are such as print quality issue, scratch, paper jamming, image placement out, oil dripping, scan band, bid engaged/disengaged, wrinkle, registration out and ripping. Vertically it shows the number of waste sheet such as 718, 87, 736, 96, 749, 67, 826, 74, 716 and 86 respectively. From the given graph, we figured out that number of wastage of sheets is higher in the defects are print quality issue, paper jamming, oil dripping, bid engaged / dis-engaged, registration out.

CONCLUSION

According to the findings, there are five primary defects that have a significant impact on the print waste of a multi-Color digital press (dry toner). These elements include technical problems, printing material quality, operator skill, machine working circumstances, and storage conditions. The working circumstances that the machine is given were determined to have the most impact on the print waste out of all these parameters, but the operator's abilities, which are responsible for the press's print wastage, had the least significant impact.

The liquid electrophotography printer needs to be regularly maintained and cleaned, and the various parts involved in the printing process must be properly adjusted in order to address these print quality flaws. Wastage is higher in the LEP and major defects are print quality issue, paper jamming, oil dripping, bid engaged / dis-engaged, registration out. Printers can enhance print quality on cellulose substrates by using

troubleshooting manuals that the printer's manufacturer provides. These manuals can provide precise fixes for each flaw which can help in reducing the print defects.

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