Technologies to Increase Productivity on Sheetfed Offset Presses

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Abstract

Major technologies enhancements in the sheetfed press typically come in waves every 4 years, which is tied to the Drupa trade show held in Dusseldorf Germany. This paper will discuss how technology has evolved over the last several Drupa trade shows and the direct impact on make ready times, running speeds and net output. We will examine the productivity in 4 sections. Section 1 will show how integration of the press can improve net output. Section 2 discusses press technology in combination with color management and the effect on reducing waste and make-ready times. Section 3 will explore the impact of remote service technology through improved uptime. Section 4 will show the conclusion based on the results of a printer ESP out of the UK who is arguable the most productive printer in the world and review his recent production figures and how they have transpired by continuing to upgrade technology. This of course has a huge bottom line impact which you can judge by yourself.

Introduction

Over the past several years as many Printing companies have focused on trying to survive, reshape their market space, to implement what we have heard all too often become a "Marketing Service Provider" all of which makes sense and hopefully adds a new revenue stream from your value add. I would argue there is another approach to improving profits and growing revenue. The concept is actually quite simple in terms of mind set. It involves moving from a job shop mentality to a manufacture plant. Many will think this doesn't apply to my work, and we sell jobs that are uniquely different making it impossible to change our approach. I would argue if you don't change your approach soon on your terms, someone else will force the issue on their terms and timeline. So let's start by tackling your highest budgeted hourly rate machine and move to the Sheetfed Press.

Heidelberg

As we move over to Sheetfed let's first walk down memory lane when printing was booming, and the equipment suppliers were living a dream. That's right we're in 1997 and Presses along with CTP's are going in around the country. However if we look back and use some old press data as a point of reference we quickly see the Press time allocation for a typical run of 5000 sheets and how the time was spilt. When looking at Figure 1.1 below and the 7500 sheet press run which many print shops would consider a typical commercial run its clear the vast majority of the time 43% was spent on running the press. Followed by general press setup 11%, Color and Registration 11%, Ink and Coating setup accounting for 10% time each, and finally plate changing at 6%, internal job ticket review 5% and blanket impression wash up 4%, which was the hot trend in automation back then. By all accounts this was a big improvement over the average press installed.

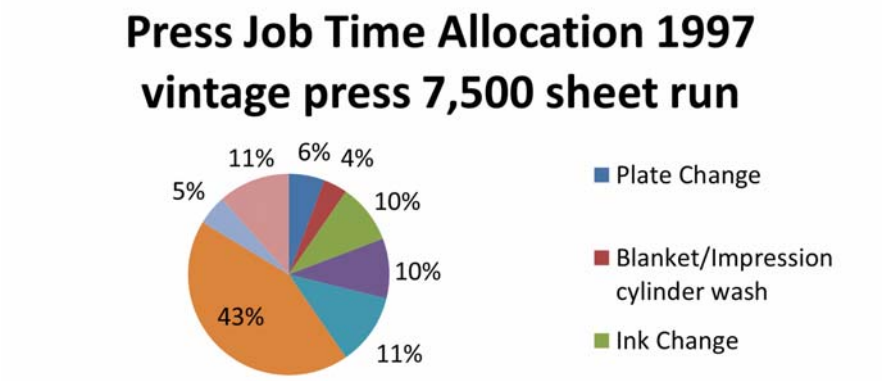

Figure 1.1: *Press Time Allocation 5000 sheet Run, 1995 vintage press*

As previously stated Drupa marks the time each Sheetfed supplier has continually added technology and all of us would argue any new press you buy today would greatly improve those numbers. Sure each press supplier would have different features and benefits which translate into their USP's but the point is any new press will improve your bottom line over a mid 1990's model. This point is so important due to the simple fact that print buyers today don't want to pay anymore for your products. So your left with squeezing out cost and trying to push value add services to increase the bottom line.

Section 1- Integration

Integration is a key component to improving productivity. As we remember the chart above at average time spent on reviewing the job ticket and basic press set up was 16% of total time allocation. In figure 2.0 below you will see what features are preset for a new Sheetfed Press automatically. It starts with the data that entered in the MIS or Prepress and contains basic jobs ticket data and moves over to sheet parameters which then translate into major components settings on the press saving considerable time. More importantly this also eliminates many errors often coming from miss interpreting the jobs ticket or miss measuring the substrates size or thickness.

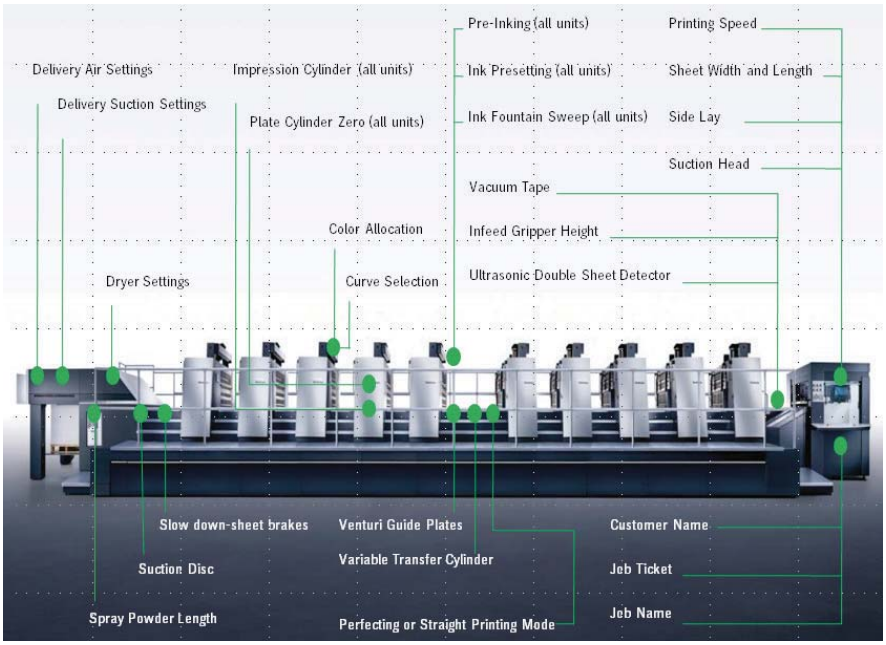

Figure 2.0: *Major Components of press set up automatically through Integration of Prepress and MIS.*

If we take Integration to another level throughout the workflow as shown in Figure 3 we introduce the color management path which will reduce the 11% Color and registration time allocation as show in figure 1.

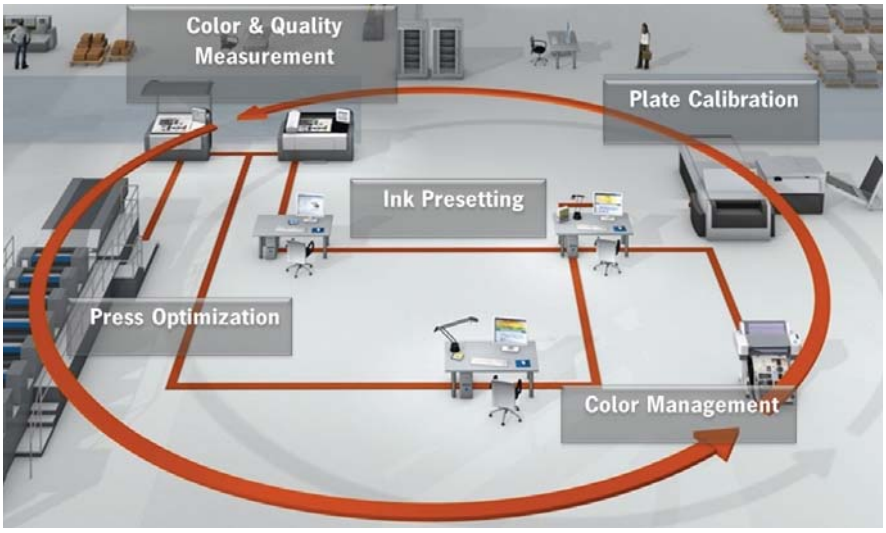

Figure 3: *shows example of the color management cycle and integration path.*

Color management has come a long way with the introduction of G7- IDEAlliance process into the North American market. Europe primarily uses the PSO The Process Standard Offset developed by Fogra which is a similar concept. Additionally the integration on certain press models allows access to press reports for those shops that do not currently run a MIS System.

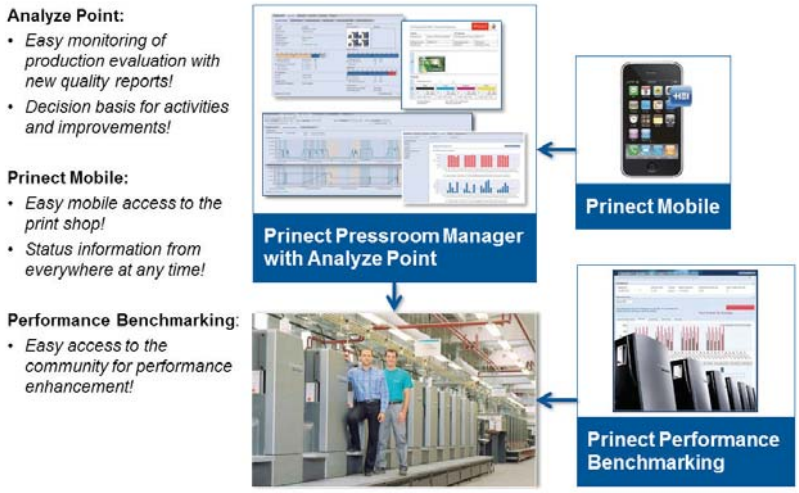

Figure 3.1: *Show how integration can help overall by tracking success.*

Figure 4: *Sample of data these reports would capture automatically.*

With automatic press reporting being available for each job, print shop managers can now for the first time see live data without operator interpretation. The time recorded is directly input based on press activity. This step can and has led to continuous improvement plans.

There are also manufacturing process being introduced to the printing industry and many shops have adopted from Kaizen. Kaizen refers to activities that continually improve all functions and by improving standardized activities and processes, kaizen aims to eliminate waste or create Lean manufacturing process.

The Lean manufacturing process has a method of measuring efficiency which is shown below and referenced as OEE which stands for Overall Equipment Efficiency. See figure 5.

Definition of the OEE measures

Quality Index: Share of good sheets of all printed sheets in percent
Total of all good sheets / Total of all printed sheets

Speed Index: Utilization of maximum printing speed in percent
Average Press Speed / Maximum Press Speed

Time Index 1: Share of printing within operation time
Total Printing Time / Total Operation Time

Time Index 2: Share of printing within operation time
Total Printing Time / Total Available Time

OEE 1: **Quality Index** x **Speed Index** x **Time Index 1**

OEE 2: **Quality Index** x **Speed Index** x **Time Index 2**

Figure 5: *OEE Chart.*

In the below Figure 6 example you the basic calculation and how the OEE is determined.

Example of OEE calculation based on one job

Sample Job: 15,000 good sheets
Waste Allowance 800 Sheets (2% run waste = 300 sheets, 500 make ready sheets)
Average Speed 12,500 impressions / hour
Press to run CD102, available time 2 hours

Quality Index: 15,000 good sheets / 15,800 total sheets

Index	Calculation	Index-Value
Quality Index	15,000 good sheets / 15,800 total sheets	94.90%
Speed Index	12,500 / 15,000 impressions per hour	83.30%
Time Index	1.2 hours printing + 0.5 hours make ready = 1.7 hours	85.00%
	1.7 h/ 2h	
OEE	94.9% x 83.3% x 85.0%	67.00%

Figure 6: *OEE Calculation Example.*

With all the data available through today integration it becomes easy to see how this can drive increased productivity.

Section 2- Press Technology

Each of the press suppliers today have introduced technology which allows the press operator to spend more time at the operating console focusing on the manufacturing process.

Figure 7: *Prinect Press Center Console with WallScreen.*

In addition to the new consoles with WallScreen allowing an overview of the press there is a higher level of intelligent operating software such as the Prinect Press Center Console Intellistart software by Heidelberg or Komori's KHS-AI.

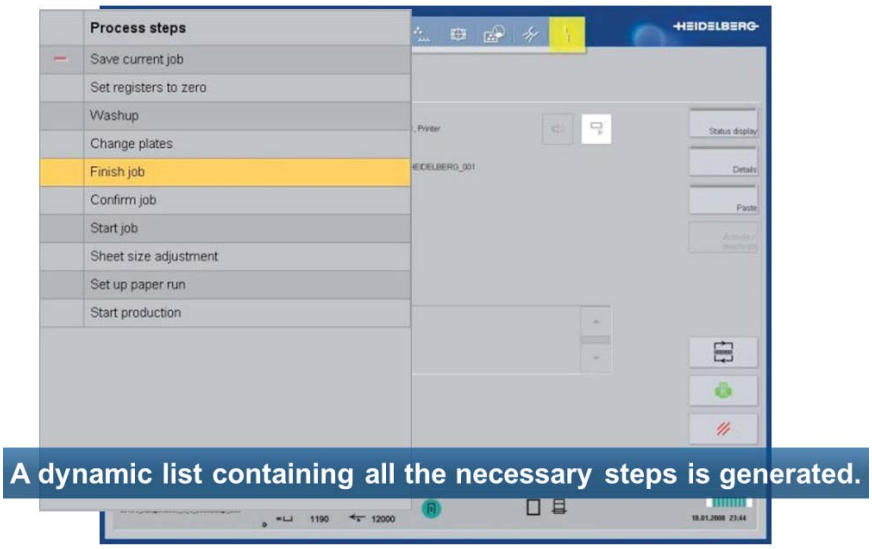

Figure 8: *Prinect Intellistart Software creates a Dynamic job list to expedite the make-ready is the most efficient time.*

With the intelligent software we introduce a standard way of handling the make ready process and this alone starts to take the print shop into that much needed manufacturing process. Internal Studies from Heidelberg have shown the intellistart can improve efficiency by 8% and reduce the number of steps by up to 70%. Again, any intelligent software will improve the manufacturing process.

If we look into the Color Measuring devices today, again all press suppliers will offer a close loop measurement device. The options vary from density control to spectrophotometric measurement which recognizes the complete visual color spectrum in the CEILab color space or an RGB Camera which recognizes a smaller portion of the color space as shown in figure 9.

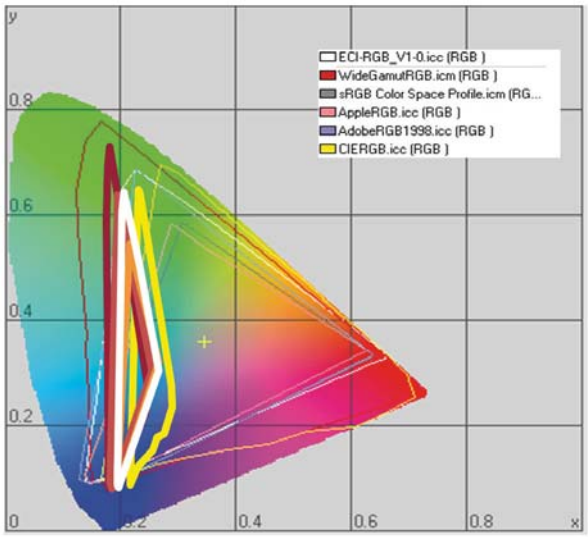

Figure 9: *Ceilab color space and RGB Color Gamut*

The benefits of the closed loop systems can be measured in multiple areas, such as a reduction in Make- Ready time as well as a reduction in wasted sheets. The devices vary by press supplier, but if we continue our approach of presses installed in the 1997 range all models today would have a significant impact on productivity.

The devices vary by manufacture and can be, offline a separate console, or nearline or inline such as in the press as shown in figure 10 and figure 11.

Figure 10: *Heidelberg's Prinect Inpress Control Spectrophotometer.*

Figure 11: *Komori's PQA-S: Inline quality check + inline density control*

If we know look at the impact of the make-ready over the various drupa vintage press models you will see just how the Integration, Automation and Color Management has impacted those productivity figures. See Figure 12 for a broad sample using the same 7500 sheet run today.

Productivity of Drupa Vintage Press models

		Typical Speed 15,000		Typical Speed 15,000-16500		Typical Speed 18,000	
	(Drupa 1995)	2000	2004	2008	2014	Limited Automation	High Automation
Average run-length	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Specification							
Average make ready time [Min]	**56**	**41**	**39**	**26**	**23**	**19**	**13**
Effective production speed	**10,177**	**11,588**	**11,588**	**12,376**	**12,376**	**15,981**	**16,862**
Utilization	**75%**	**75%**	**75%**	**75%**	**75%**	**85%**	**85%**
Performance	**100%**	**126%**	**129%**	**162%**	**170%**	**243%**	**286%**
Capacity							
Capacity 1-shift [mio sheets/a]	6.7	8.4	8.7	10.9	11.4	16.3	19.2
Capacity 2-shift [mio sheets/a]	13.4	16.9	17.3	21.8	22.9	32.7	38.4
Capacity 3-shift [mio sheets/a]	20.1	25.3	26.0	32.6	34.3	49.0	57.6

Table 12: *Productivity Chart Based on various Drupa Models.*

In another example we show the break down a little difference to give a broader perspective on the waste and time reduction based on the Integration, Color Management and Closed loop Spectral Color Control.

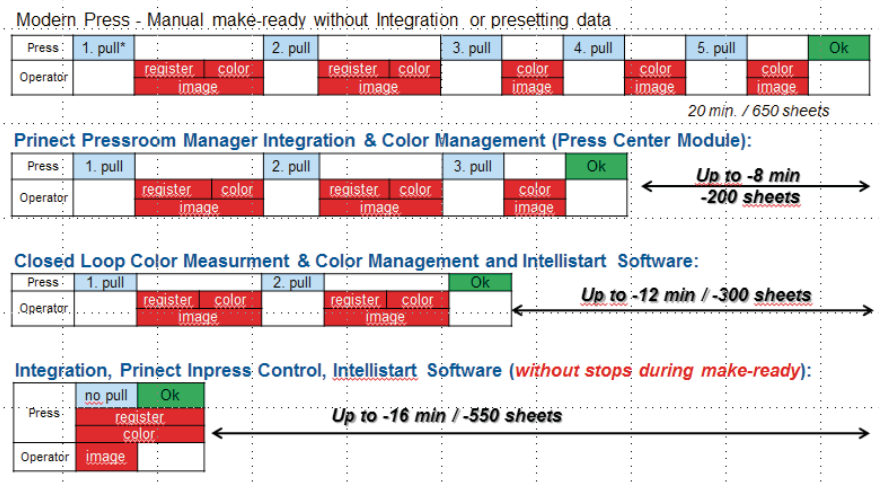

Figure 13: *Make Ready Chart, time and paper Savings.*

Section 3- Remote Service

Remote Service is a technology seen in almost all sophisticated electronic devices and allows for self-monitoring and remote diagnostics and in some cases even the repair. In terms of Press suppliers again each one offer a variation of remote service based on the level of electronic integration within the press console. Heidelberg offer System Service 36 on press models allowing this remote monitoring element after customer approval. Komori offers Komori Kare and a level of maintenance management with the KHS – AI system.

See below for a basic guideline on how equipment has changed over the years.

Figure 14: *Shows early Drupa Press in Blue vs the newest Drupa Technology*

With the highly automated press comes a higher maintenance requirement as you've seen in Figure 12 the net output can be almost 300 % more productive think of it this way that's almost 3 years of production completed in the first year. This level of high output requires maintenance and improved uptime to keep the manufacturing process moving. Today's press technology is trying to seek out problems before the press is down and this technology continues to improve each year. The chart below shows how many impressions are being produced per year of a number of long perfectors. In Figure 15. We will show more than 9000 jobs per year and over 56 million sheets.

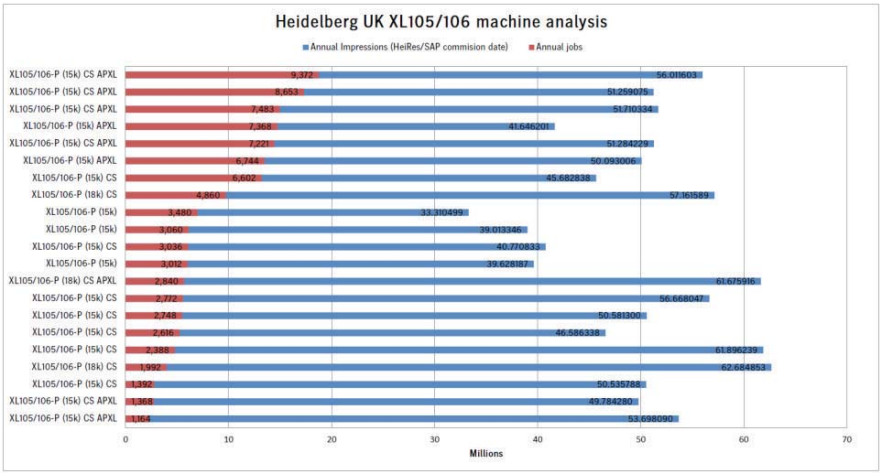

Figure 15: *Performance chart of Long Perfector's installed in the UK.*

Section 4 - Conclusion

As we have seen in the previous sections the net output can have a significant impact, but we have yet to reference how it directly influences the bottom line. For this portion we would like to discuss a company out of the UK named ESP. Managing Director Anthony Thirlby has shared his experience in changing out technology and the facts and figures that can't be disputed. In 2008 ESP was a $12.2 million dollar per Year Company running about 4000 jobs, and an average run length of 16,000 sheets. Like many business in 2008 there was heavy pressure on margins.

The new Strategy of ESP and results shown involve the overall print production process, and it makes sense to share the full story with you. However, when you dig into the Sheetfed production figures you will agree the productivity is incredible and tied to the Integration, Color Management, Press Technology and Uptime. In reviewing the data the average sales per-employee was at $221,000 per head. The equipment was newer 2008 vintage and yet the business climate forced every decision to be purely reactive and each day was filled with discussions on how to move the bottle neck, could they meet the deadline, will we make a profit, we have short run and long run work, how can we do both? Should the work go digital or offset? See figure 16 for more facts.

- $12.2 Million Jobbing Commercial Print Shop
- $221k Turn-Over Per Head – 55 Staff
- Labour Intensive Clients and Processes (13 Touch Points In Pre-Production)
- No Product Alignment Or Understanding Of Market Dynamics
- X4 40" Presses, x1 SM102 10P, x2 5 Colour 102 & 2 colour 102
- Purely Reactive – Capacity Positioned For Three Months of The Year
- Disjointed Reporting Structures - All Retrospective
- 4 Hands Off Managers And x5 Directors
- Post-Press ***Always*** The Capacity Headache
- Cost Plus Model Based On Legacy Thinking
- Average Run Length 16k / 4000 Orders A Year

Figure 16: *ESP internal data as of 2008.*

After several rounds of business strategy discussions between partners the new objectives for managing the business were identified. The goals are as follows, and shown in figure 17. Automate the business and decision making by eliminating the emotions, have it be fact based. Focus on reducing the overall touch points down to 3 in the pre-production stage. The print quality would be determined by the technology and not the individual deciding if the customer would like the job. ESP decides to develop a sales product range that can maximize production and plan on capacity backwards from post press first since this was often an area of backlog. They developed a variable costing model and positioned business for the short runs that were to follow, 7000 run lengths and 16,000 jobs per year.

Sales were targeted at $330,000 per employee for the future. Through this process they decided to right size and move into the half size market to manage the shorter run lengths. This was a turning point as it quickly proved the higher automation and integration was able to keep up with all the work that was previously printed on a 40 inch press, but with lower manufacturing cost. With this thinking now showing proof of the concept the newer technology available on the XL 105/106 allowed ESP to transition again.

Figure 17: *ESP Goals - Wish list for the future.*

In the following phases of ESP's transition they installed the XL 105 and XL 106 with Prinect Inpress Control the inline Spectrophotometer allowing the technology to continue to decide on quality. The combination of continuous improvement, integration and color management allowed ESP to regularly hit the 2 minute make-ready mark and a waste of just 0.04 percent.

On top of that, the overall output was through the roof. As shown in figure 18, they are able to accomplish 341 make-readies and 346,000 sheets in a 32 hour period. In figure 19 they show production figure of 134 make-readies and 273,000 sheets in 24 hours. Each of the blue lines in the chart represents a new job.

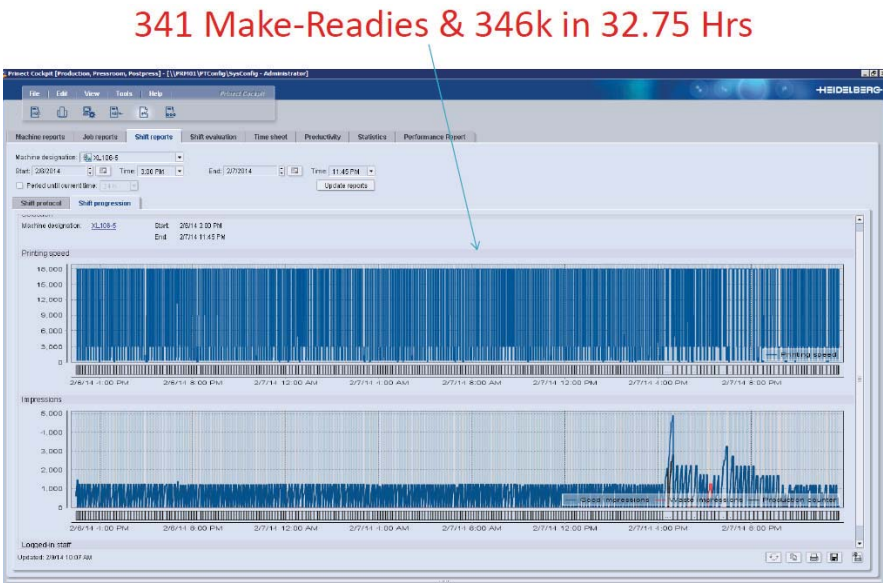

Figure 18: *Prinect Cockpit reporting software capture real time production data.*

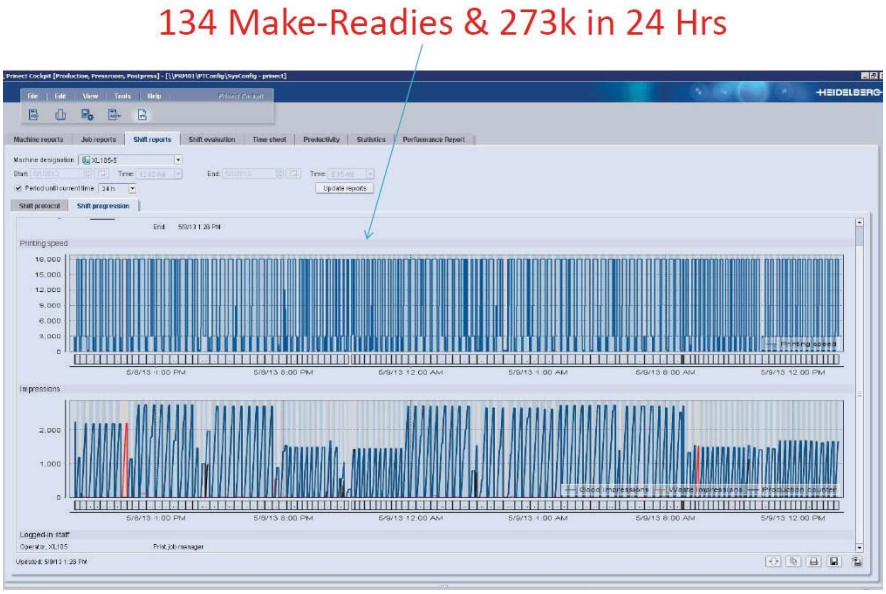

Figure 19: *Prinect Cockpit reporting software capture real time production data.*

In looking at the net results today 2014, ESP is at $25.8 million in revenue. They have produced 165 million sheets over the last year on 1 XL 105 and 1 XL 106 press that's an average over 80 million per press. Think about that for a second, there is no way this would be possible if the technology, integration and management approach was not focused on continuous improvement. The average run length continues to go down for ESP and currently sits at 4,050 sheets, however today they can produce a total of 25,000 jobs per year due to increasing productivity with the latest technology available.

Figure 20: *Today's Facts on ESP.*

In looking into ESP's main daily criteria shown in Figure 21 you see a formula for success, but in the end it's a combination of the 3 M's. (man, machine and materials) that allows ESP to continue its success.

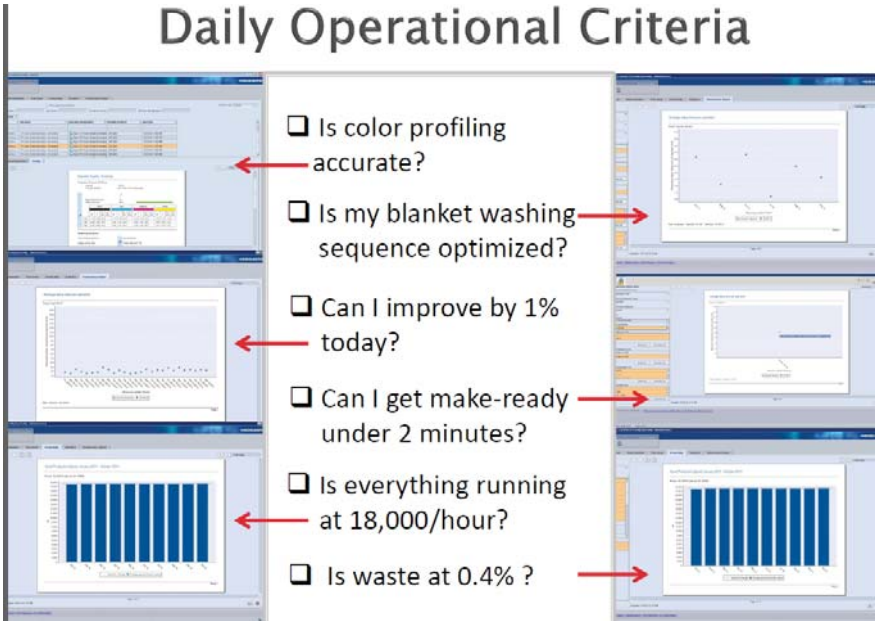

Figure 21: *ESP's Daily Criteria on continues improvement.*

Anthony Thirlby offers 5 key take away's to doing business today.

- Understand your commercial positioning.
- Embrace technology and make running a business simpler
- Understand, measure and develop.
- Spend time on press, do a SWOT on transition times to better understand any challenges.
- Minimize Touch points from file receipt to product in the box.

The take away from this paper should be that technology on many fronts is one of the key methods to squeeze out operational cost and improve margins. In the end if you don't take action and work on this continuous improvement plan and automate someone else will. Unfortunately this can often create a long list of former customers.

References

1. Heidelberg Internal Make-Ready studies

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