

By the numbers: How EFI Nozomi digital technology expands capacity and boosts profitability

Contents

Executive summary: Adding an EFI Nozomi LED digital printer to the shop floor can generate extra analog capacity.	3
Single-pass digital printing technology can create a competitive edge for today's corrugated plants	4
Our data collection and analysis process	5
Data collection per machine included real-world measurements	7
Profit generated from optimizing digital and analog printing exceeded \$1 million annually	8
With Nozomi digital printing on the shop floor, analog capacity increased by 42%	9
ROI analysis shows payback in less than two years	11
Conclusion: The move to digital increases analog capacity, capabilities, profits, and ROI	12

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EXECUTIVE SUMMARY:

Adding an EFI Nozomi LED digital printer to the shop floor generates extra analog capacity

The following case study demonstrates – by the numbers – how adding an EFI™ Nozomi 14000 LED digital industrial printer to a corrugated packaging plant expands total manufacturing capacity.

This in-depth analysis is not theoretical. It was conducted in collaboration with the leadership of a North American converting plant and demonstrates that investing in digital technology adds capabilities and extra flexibility by:

- Allocating jobs to the equipment that produces high quality graphics more efficiently – based on the characteristics of each order
- Leveraging existing analog capacity without the need to invest in new flexo presses
- Maximizing overall equipment effectiveness (OEE) and overall plant profitability
- Proving to be an attractive capital investment with rapid return on investment (ROI)

CUSTOMER PROFILE

Corrugator plant equipped with 8 flexo machines, 1-5 colors, producing 1.6 million MSF per year

ANALYSIS

Based on two flexo printers (4/5 color RDC) with a total output of 560,000 MSF per year.

RESULTS	
<p>+42%</p> <p>% Additional analog capacity</p>	<p>+377,000</p> <p>Total additional capacity (MSF)</p>
<p>+\$3 MILLION</p> <p>Additional potential annual revenue</p>	<p><2 YEARS</p> <p>Digital ROI</p>

Single-pass digital printing technology can create a competitive edge for today's corrugated plants

Much has been said about how digital technology is helping corrugated packaging manufacturers respond to the challenges and opportunities being created by trends, such as e-commerce and increased demand for sustainable packaging. In this regard, single-pass digital printing technology addresses the expanding needs of corrugated plants in terms of:

- Generating higher value-added products, which increase the average margin and help build customer loyalty
- Reducing manufacturing costs, which continue to be key in a highly competitive market
- Securing the available capacity essential to capturing demand and to respond to the relentless deadlines required by customers – all while optimizing capacity

Today's market realities add stress to plant operations that the new EFI Nozomi digital printing technology can mitigate – by generating new total production capacity, while increasing productivity, and adding extra flexibility.

In the following, we present the cost benefits of adding digital technology to a corrugated converting plant. The numbers show definitive improvements in:

- Cost optimization for all types of orders
- Increased overall profitability
- Extra capacity generated



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Our data collection and analysis process

For this study, production data was collected for approximately 90 days.

- We measured the total volume printed with each type of technology and compiled an average job profile for the plant
- With this data, we were able to analyze the appropriate order size to be printed with digital technology
- From this, we were able to calculate the impact of moving orders from analog equipment to digital, both in terms of available capacity and profitability

CUSTOMER DISCOVERY

DATA COLLECTION

1. Total printed volume per facility
2. General capabilities of each piece of printing and converting equipment – flexo, litho, digital
3. Profile of average job produced per machine
4. Detailed breakdown of all jobs printed per machine (minimum of three months of data is preferred)

BUSINESS ANALYSIS

OUR ASSESSMENT REPORT WILL IDENTIFY

1. Optimal digital crossover point per machine
2. Detailed cost and capacity summary for volumes below the target digital crossover point
3. Potential additional analog and digital capacity
4. Potential revenue and profit opportunities

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BUSINESS FIT			
	+++	++	+
PRINTING TECHNOLOGY	<ul style="list-style-type: none"> • Litho (outsourcing) • HQ flexo volume (>4C) • Digital volume • Standard flexo (<4C) 	<ul style="list-style-type: none"> • Litho (In house) • Higher % HQ flexo volume (>4C) • Lower % Standard flexo (<4C) 	<ul style="list-style-type: none"> • Low % HQ flexo volume • High % Standard flexo (<4C)
CONVERTING EQUIPMENT	<ul style="list-style-type: none"> • Multiple flatbed die-cutters • Printing + RDC • FG or gluers (no printing) • Laminator • FFG 	<ul style="list-style-type: none"> • Flatbed die-cutters • Printing + RDC • Laminator in corrugator • FFG 	<ul style="list-style-type: none"> • Printing + RDC • FFG
MATERIALS	<ul style="list-style-type: none"> • Litho boards • Higher % Coated vs Kemi • White test liners • Brown test liners 	<ul style="list-style-type: none"> • Litho boards • Similar % Coated and Kemi • White test liners • Brown test liners 	<ul style="list-style-type: none"> • Lower % Coated vs Kemi • White test liners • Greater % of Brown test liners

Our methodology can be applied to any corrugated packaging operation.. We can identify the profile in which the impact of incorporating single-pass digital inkjet printing technology will be the greatest. Thus, we can anticipate that in plants that produce a significant amount of high-quality work where there are complex processes (flatbed die cutters, folder-gluers) and different types of materials, digital printing will have a greater impact.

For plants that aren't currently manufacturing value-added packaging, digital printing technology should be considered because it's the most efficient way to add high-quality printing capabilities while also presenting opportunities for improving.

Data collection per machine including real-world measurements

As the chart below indicates, our analysis included critical uptime, productivity, and throughput measurements.

2021 ACTUALS	WA1	WA2	MA2
Type of Machine	FFG Ward – Die Cut	FFG Martin	FFG Ward
Process	Flexo + Die Cut	Flexo	Flexo
Colors	4/2	3/3	5/5
Average MSF per hour	11.5	8.8	48.4
Set up time (min)	28	32	23
Downtime (% HT)	53	52	57
Number of Orders	4,254	2,904	5,233
Total Open Hours	7,218	6,855	8,112
Planned Hours	3,365	3,316	3,511
OEE	14%	19%	37%
Total Annual Volume MSF	83,255	60,883	393,344
Total # Sheets per Year	5,969,580	7,981,408	18,237,030
Order Average	1,818	1,948	6,983
Average ft ²	14	7.5	21.5

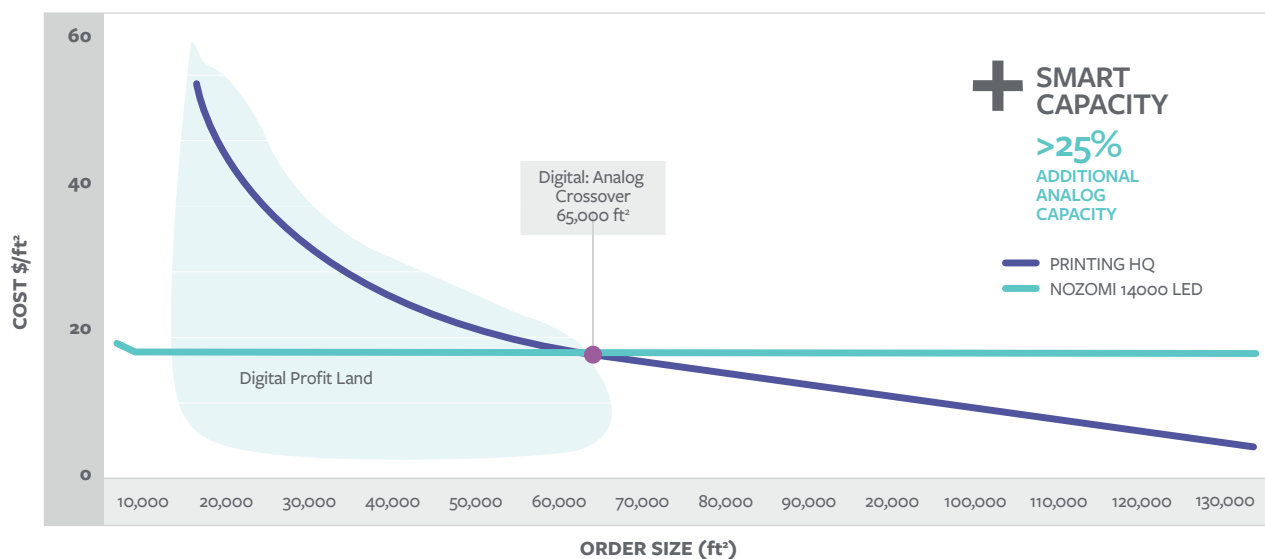
In this case, the customer decided to pick WA1 and MA2 machines. The first one is a clear candidate for optimization as it shows medium to small order size on average, evident improvable OEE, and moderate production volumes. MA2 shows better ratios but still some potential for improvement.

The next step of the study consisted of calculating the break-even point to determine the average order size for which digital printing technology was more efficient and, above which, flexographic printing technology was more cost-effective.

The unit printing costs of the analyzed presses (WA1 and MA2) and the unit costs of digital printing were compared. The average result sets the break-even point at 65,000 ft². In other words, orders up to that amount were more profitable in digital printing than in high-quality flexo.

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Profit generated by optimizing digital and analog printing exceeded \$1 million per year.



The economic digital crossover point in the chart above was used in this analysis to calculate the savings generated from digital, as well as the extra capacity released from analog. For this example, the complete box manufacturing process has been considered. More specifically, the following cost elements have been taken into consideration:

- Number of colors (cost of plates)
- Ink consumption
- Overall Equipment Efficiency (as it measures machine performance: print speeds, downtimes, quality issues, etc.)
- Labor cost
- Maintenance cost
- Depreciation
- Energy cost

Based on 90 days of order level data, we grouped orders above and below the break-even point. Then we measured the direct savings from using digital where it is most efficient. These are savings or efficiencies generated by producing orders below 65,000 ft² with Nozomi 14000 LED digital printer instead of with the analog equipment used until now.

Simply comparing printing costs of one technology to the other, we identified savings of \$1.2 million per year.

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With Nozomi digital printing on the shop floor, analog capacity increased by 42%

The chart below shows the extra profit generated by using the most efficient equipment to produce orders below 65,000 ft².

Order Length (ft ²)	Volume (MSF)	Total Volume (MSF)	Cost Efficiency				
			Average Waste	Number of Colors	Analog Cost (per MSF)	Digital Cost (per MSF)	Savings (per MSF)
11,000	4.3	130,244	6%	2	\$118.08	\$19.14	\$98.94
22,000	15		4%	2	\$42.19	\$18.49	\$23.70
33,000	19		4%	3	\$29.00	\$18.40	\$10.60
44,000	33.3		3%	3	\$23.05	\$18.40	\$4.65
55,000	33.3		3%	3	\$20.26	\$18.31	\$1.95
66,000	25.8		3%	3	\$18.40	\$18.31	\$0.09

Annual Cost Efficiency Savings			
MSF	Colors	Waste (%)	Savings
130,244	3	-4%	\$1,200,000

The chart below shows the extra capacity of the current analog equipment (flexo HQ) that has been generated by transferring orders below 65,000 ft² to the Nozomi 14000 LED digital printer. We have taken the average production times of analog and digital manufacturing and the difference between them is the extra hours available.

These extra hours can now be dedicated to orders above 65,000 ft² that have a productivity of 8,000 sqm/h resulting in an extra 249 million square meters.

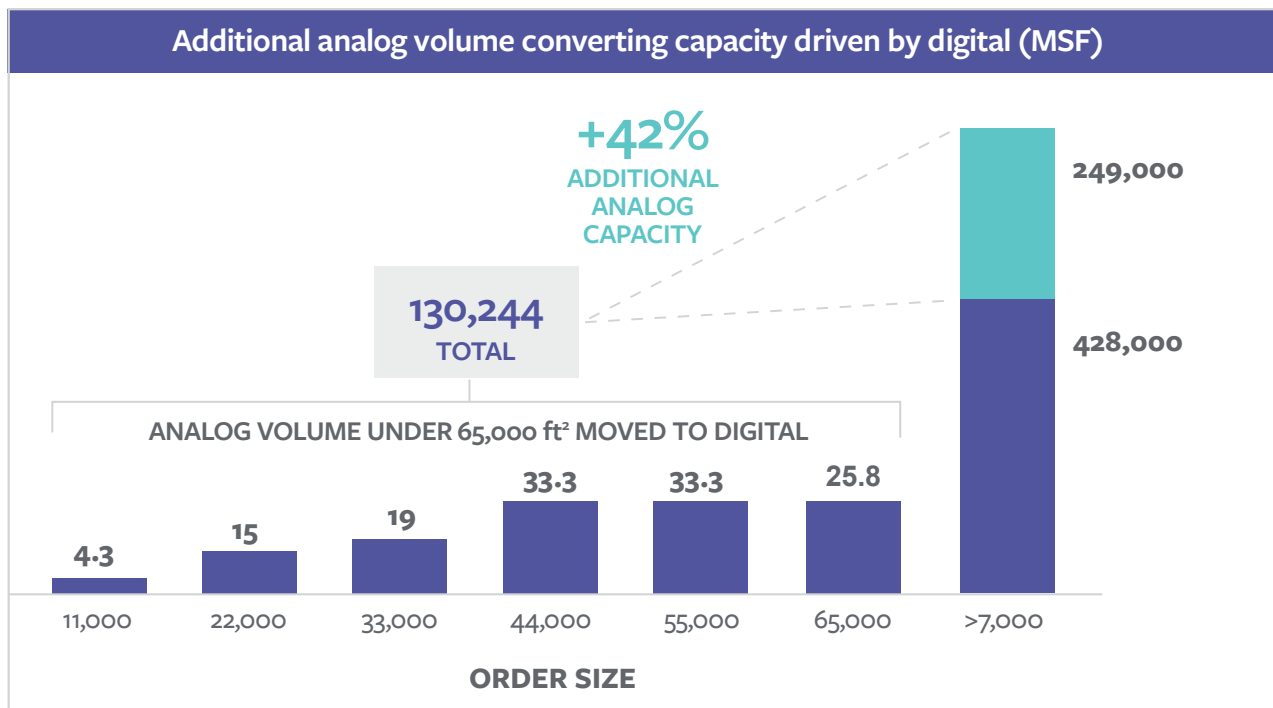
Analog Capacity				
Average Production Time for Flexo (h)	Average Flexo Production (ft ² /h)	Average Production Time for Digital (h)	Average Digital Production (ft ² /h)	Unlocked Capacity (h)
0.86	8,794	0.28	27,340	217
1.24	13,218	0.52	31,624	865
1.38	18,546	0.74	34,563	1,026
1.06	35,704	0.96	34,493	944
1.27	37,383	1.18	40,225	885
1.43	41,151	1.36	43,271	617

These 2 analog presses produce 430 million ft² per year at an average speed of 86 MSF/hour on orders over 65,000 ft².

Annual Additional Analog Capacity			
Hrs	MSF	%	Value
4560	249,725	+42%	\$2,600,000

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The following chart illustrates how the analog extra capacity generated by digital, enables an increase of 42% over the existing analog capacity.



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ROI analysis shows payback in less than two years

The last part of our analysis corresponds to the measurement of profitability. To estimate ROI, we have assumed a very conservative adoption of digital (25% equipment utilization in the first year, reaching 100% after 5 years) and a conservative margin of \$100/K square meter for analog printing.

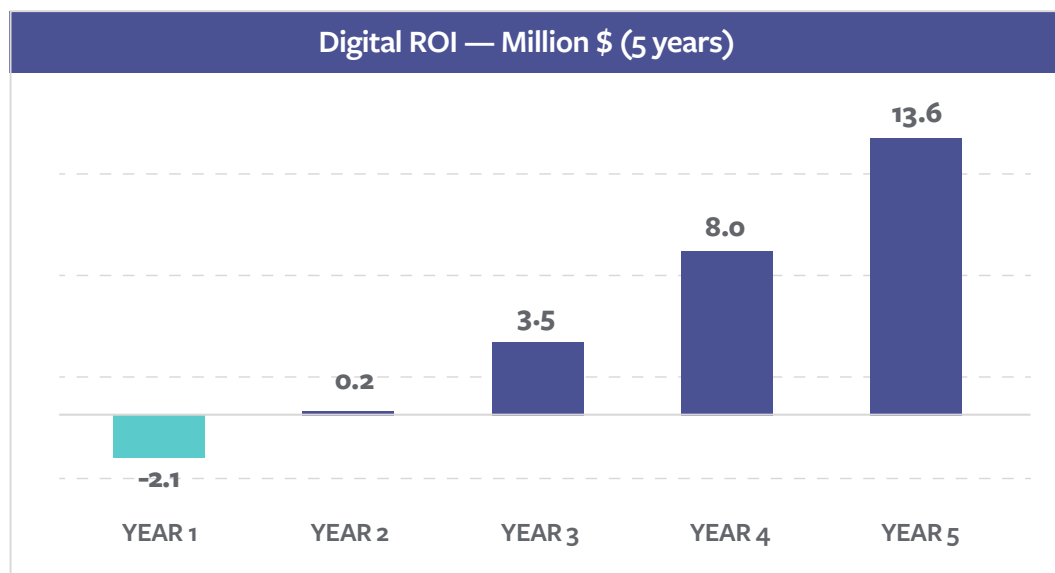
Total Nozomi capacity per year (MSF)*	130,244				
Unlocked analog capacity per year (MSF)*	248,648				
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Total Nozomi output (MSF)**	32,292	51,667	77,500	103,344	130,244
Extra Flexo output (MSF)**	67,250	107,640	161,460	215,280	269,100
Margin increase (Mil) in orders under 65 MSF thanks to Nozomi digital	\$0.8	\$1.2	\$1.9	\$2.5	\$3.1
Analog gross margin (Mil) of the extra capacity dedicated to orders over 65 MSF	\$0.6	\$1.0	\$1.5	\$2.0	\$2.5
Total extra revenue (Mil)	\$1.4	\$2.2	\$3.4	\$4.5	\$5.6
Simple Payback (Mil)***	-\$2.1	\$0.1	\$3.5	\$8.0	\$13.6

* Based on an adoption rate of 25% - 40% - 60% - 80% -100%

** Calculated on the total capacity of the equipment and its estimated conversion rate per year.

*** Simplified calculation that considers capital investment, not other possible costs such as financing or interests.

Payback of the Nozomi 14000 LED digital technology investment is achieved in less than two years.



CONCLUSION:

The move to digital increases overall capacity, capabilities, profits, and OEE

Investing in an EFI Nozomi 14000 LED industrial digital printing solution will generate efficiency and volume migration savings. And it does so with unprecedented flexibility because you can say yes to every job and produce each order with the most appropriate technology every time.

In addition, digital printing technology has a proven ability to attract new business and increase margins with higher value-added products. Some examples are e-commerce boxes printed on the inside, point-of-sale displays with high quality graphics, versioned packaging for promotions, customized boxes for customers, and more.

The numbers prove that now is the time to add digital printing technology with a robust, truly industrial solution such as EFI Nozomi 14000 LED industrial digital press.

Let's be brilliant. Together.

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