IOWA STATE UNIVERSITY

Printing Services

Journey to Production Inkjet

By Nathan Thole, Director

April 4th, 2023

About Iowa State University

Location
Ames, Iowa

Founded
1858

Enrollment
27,854 (Spring 2023)

Students come from every county in Iowa, every state in the country, and from 114 countries.

Academics
10 schools and colleges, 100 majors

Athletics
Cyclones- Big 12 Conference

Famous Alumni
- George Washington Carver
- Carrie Chapman Catt
- John Vincent Atanasoff (inventor of the first electronic digital computer)

History of ISU Printing Services

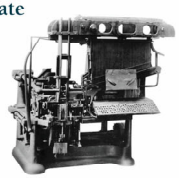
IOWA STATE UNIVERSITY 100 YEAR 1922-2022 ANNIVERSARY Printing Services

618-906
T'ang Dynasty (China) first printing performed using ink on carved wood blocks

1456
Johannes Gutenberg prints the Bible

1858
Iowa Agricultural College and Model Farm (now Iowa State University) established

1886
Invention of the Linotype



1940s
Printing Services operates from the second floor of the Services Building (a.k.a. Snedecor Hall)

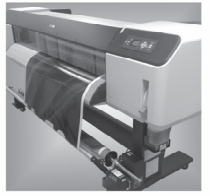
1985
Desktop publishing takes off

1980
Warehouse addition to Printing and Publications Building

2006
First Digital Press installed; Kodak NexPress 2100

2002
First web-based order form introduced

2010
First eco-solvent wide-format installed; Epson GS6000



1843
Rotary drum printing was invented

1922
Printing Services established; basement of Morrill Hall

1938
Xerography is invented

1951
The first *Drupa* print trade show is held in Düsseldorf, Germany

1967
Construction approved for new Printing and Publications Building (current location); First copy center opens in Marston Hall

1993
First color copier is placed at Memorial Union copy center; Publication Office merges with Printing Services

2000
First 4-color offset press installed; Computer-to-Plate technology introduced

2018
First flatbed wide-format printing and cutting equipment installed

2022
Printing Services celebrates 100 year anniversary; First Production Inkjet printing press installed

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Our Team


IOWA STATE UNIVERSITY
STATE
IOWA STATE UNIVERSITY
100 YEAR
1922-2022
ANNIVERSARY
Printing Services

Printing Services Facts & Figures

- 22 Full Time Employees, 2-8 student-employees
- Fully Self-Supporting
- Have Right of First Refusal
- Reports to Specialty Business Services & Cultural Arts Division, under Operations & Finance
- $3.2 million Annual Revenue (FY2022)
- 13,131 total orders in FY2022
- Able to insource from City, State, Municipality and Non-Profit organizations through 28E agreements.
- Outsource about $800k annually

As of 03/2023

Convenient Campus Locations

IOWA STATE UNIVERSITY 100 YEAR 1922-2022 ANNIVERSARY Printing Services

Main Location

Printing & Publications Building

2333 Kooser Drive

515-294-3601

print@iastate.edu

Hours:
7:30 am- 4:00 pm, M-F

No weekend or evening hours, special hours available upon request.

Quick-Print Center

Student Innovation Center

606 Bissel Rd, Room 2114

515-294-0008

printsictr@iastate.edu

Hours:
7:00 am- 6:00 pm, M-F

No weekend hours, special hours available upon request.

Research and Discovery

Disclaimers: this is the story of how we ended up with a production inkjet press…it's not necessarily the right or best way! This is not an intentional endorsement of Canon.

2016: Introduction to Production Inkjet

My first experience with true production-level cutsheet inkjet printing blew my mind. I was given a demo on a Fujifilm JPress in Chicago.

…and that's when I knew it was our future.

Research and Discovery

- Since 2016, I kept a close eye on inkjet technology, talked to vendors and peers, attended special events and sessions dedicated to inkjet.
  - The Inkjet Summit was very beneficial, as it was 100% dedicated to this technology. It also helps that most can attend for free!

Request for Quote Process

- 2019:
  - We knew we were at a point that our Kodak NexPress SX3300 digital press was near the point it needed to be replaced. This was mostly due to rising costs and efficiency.
  - Offset printing was becoming increasingly less efficient and appropriate to the jobs we were getting
- Early 2020:
  - An RFQ for a digital press was generated and distributed. Bids were received just as the COVID pandemic was getting started, so it was all put on hold, and eventually cancelled.

Request for Quote Process

- August 2021:
  - Ready to revise RFQ and request bids again
    - COVID pandemic was diminishing, order levels increasing
    - Equipment was in an even higher need of being replaced. (Rising maintenance/click costs on NexPress)
    - 2 of 2 Offset press operators retired within a few weeks of each other mid-2021
  - RFQ submitted for a "Production-Level Sheet-Fed Printing Press"
    - High-Level Specifications:
      - Preferred: Inkjet technology *(but not required)*
      - Required: ability to print on standard offset papers, coated and uncoated, as well as synthetic and textured stocks, materials, without the need for special coatings or treatments.
      - Required: ability to auto-duplex (both sides of substrate) print in one pass through the machine, of up to 350gsm.
      - Required- ability to run the equivalent of 140 -8.5"x11" 1-sided pages per minute, in full color

    (I can share a copy of our RFQ to anyone that sends me an email requesting it- nthole@iastate.edu)

Bid Evaluation Process

- Based on 5.2 million press sheets (13x19) per year (B/W and Color)

Just a small piece of my Excel evaluation calculations:

	Supplier	Access Systems (Access Technologies Inc)	Canon Solutions America Inc	Eastman Kodak Company	Fujifilm North America Corp	HP Inc	Infomax Office Systems Inc	Konica Minolta Business Solutions USA Inc	Mark Andy Print Products (Mark Andy Inc)	Ricoh USA Inc
	Model Name	Ricoh Pro C9210	VarioPrintiX3200 Inkjet Press	Nexfinity Ultra	J Press 750S	Indigo 12000 – CA405A	Canon imagePress C10010	AccurioJet KM-1e	Presstek/Inc. Ryobi 52DI-LED-UV & 34DI-LEDUV	Ricoh Pro C9210
	Print Technology	Toner	Inkjet	Toner	Inkjet	Liquid ElectroPhotographic Inks (LEP)	Toner	UV Inkjet	UV Offset	Toner
	Key/Bonus Feature(s)	Long-Sheet Feed	Speed, Low Ink Cost, Ability to add in-line booklet maker	5th Station Colors, Long-Sheet Feed, Similar to NexPress, , Ability to add in-line booklet maker	B2+ Sheet, Speed	B2 sheet, extra ink colors, substrate Flexibility	Bidder intended this device for a backup to primary	Speed, Large B2+ Sheet, Low Ink Cost, Substrate Flexibility, UV-Cured	Run Speed, Higher Quantities	Long-Sheet Feed
	Key Drawbacks/Limitations	High Click cost, Not Heavy Duty, Not Laser Safe, Slow	Limited Max Sheet Size, High Investment	Higher Click Cost, Laser-Safe toner decreases quality	Does Not Duplex, substrate weight limits, High investment Cost, Single Paper Feed	Complex meter costing	Not Heavy Duty, High Click Cost, Not Laser Safe, Too Slow	High investment Cost, Single Paper Input	Does Not Duplex, high make-ready cost and time, NO Variable print	High Click cost, Not Heavy , Not Laser Safe, Slow
	Extended Total Price (1-time Cost)	$ 105,904.33	$ 896,777.00	$ 381,249.00	$ 979,995.00	$ 849,000.00	$ 147,928.00	$ 1,069,000.00	$ 753,211.00	$ 178,500.00
	60 month $1 Lease /Month	$ 1,853.33	$ 16,591.00	$ 7,551.60	$ 18,955.00	$ 15,936.00	$ 2,465.47	$ 19,069.00	$ 14,137.00	$ 3,373.65
	72 month $1 Lease /Month	NA	NA	NA	NA	$ 13,941.00	NA	$ 13,941.00	NA	NA
	84 month $1 Lease /Month	NA	$ 12,340.00	$ 5,661.63	$ 14,020.00	NA	NA	$ 14,825.00	$ 13,829.00	NA
	120 month $1 Lease /Month	NA	NA	NA	NA	NA	NA	for 36	NA	NA
Primary Printing Press Unit Price	Press Price	$105,904.33	$811,777.00	$364,537.00	$999,995.00	$899,000.00	$147,928.00	$1,054,000.00	$280,000.00	$178,500.00
	Max Sheet Size	13x49.5	13.78x20	14x39.37	23x29.5	29.527 x 20.866	13x51.2	23x29.5	20.47x14.76	13x49.6
	Max Sheet Size (Duplex)	13x40.5	13.78x20	14x26	DOES NOT AUTO DUPLEX	29.527 x 20.866	13x30	23x29.5	Does NOT AUTO DUPLEX	13x40.5
	Max Paper weight (GSM)	470	350	530	297	406	406	24pt	24pt	470
	Speed (Max Sheet Size images/min)	30			60	58	50	50	167	30
	Speed (8.5x11 images/min)	135	312	140	360	230	100	300	333	135
	Speed (12.5x19.5 images/min)	66	143	64	120	115	50.00	100	166.50	68.00
	Total Est. Run Time (hours) 10 years	15,060	7,063	15,527		8,720	19,842	9,996		14,621
	Total Existing ISU Est. Run Time (hours) 10 years	*23,296*	*23,296*	*23,296*	*23,296*	*23,296*	*23,296*	*23,296*	*23,296*	*23,296*
	Estimated Run Time Savings (Hours, 10 Years)	**(8,236)**	**(16,233)**	**(7,770)**		**(14,576)**	**(3,454)**	**(13,300)**		**(8,675)**
	Total Est. Digital Color Ink/Toner Cost 10 Years	$1,392,265	$846,945	$1,516,995		$1,297,945	$2,023,554	$1,098,154		$1,418,136
	Total Est. Maintenance Plan Cost 10 Years	$0	$184,740	$172,200	$0	$385,743	$0	$356,718	$0	$0
	Total Estimated Ink & Mtx Plan Cost 10 Years	$ 1,392,265	$ 1,031,684	$ 1,689,195		$ 1,683,688	$ 2,023,554	$ 1,454,871		$ 1,418,136
	Total Equip. Investment Cost (10 Years)	$ 116,200	$ 1,061,560	$ 500,577		$ 1,028,752	$ 152,928	$ 1,270,300		$ 207,419
	Estimated Total Cost of Ownership (10 Years)	$ 1,508,464	$ 2,093,244	$ 2,189,772	$ -	$ 2,712,440	$ 2,176,482	$ 2,725,171	$ -	$ 1,625,555
	Total Estimated Labor Cost, 2 Digital operators, 10 Years	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550	$ 1,781,550
	Total Est. Current Cost ISU (10 Years)	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569	$ 4,913,569
	Estimated Savings vs. Current ISU equipment(10 Years)	-$1,623,555	-$1,038,775	-$942,247		-$419,579	-$955,537	-$406,848		-$1,506,464
	10-Year Average savings per year	-$162,355.46	-$103,877.46	-$94,224.67	$0.00	-$41,957.91	-$95,553.73	-$40,684.76	$0.00	-$150,646.44
	Color Toner/Ink Cost/Max Press Sheet	$ 0.08670	$ 0.01860	$ 0.06000	$ 0.03500	$ 0.05709	$ 0.08600	$ 0.04738		$ 0.08940
	Color Toner/Ink Cost/8.5x11	$ 0.02890	$ 0.00930	$ 0.01500	$ 0.00583	$ 0.01427	$ 0.04300	$ 0.00790		$ 0.02980
	Color Toner/Ink Cost/12.5x19	$ 0.02890	$ 0.01860	$ 0.03000	$ 0.01750	$ 0.02855	$ 0.04300	$ 0.02369		$ 0.02980
	Color Toner/Ink Cost/29.5x20.81	NA	NA	NA	$ 0.03500	$ 0.05709	NA	$ 0.04738	NA	NA
	Color Toner/Ink Cost/29.5x23	NA	NA	NA	$ 0.03500	NA	NA	$ 0.04738	NA	NA

Proposed Primary Press Summary | Primary Press Pricing by Line | Primary Press Evaluation Matrix | ISU Print Data | Secondary Press Pricing by Line | 2ndary Press Evaluation Matrix | Bookletmaker | Pricing by Line Ite ...

Bid Evaluation Process

Highlights and Assumptions:

- Able to reduce from 4 press operators to 2
- Press was almost 3 times faster than any existing press we had
- Maintenance and Meter costs far less than NexPress
- Able to consolidate and simplify workflow
- Able to print 1-up at no click cost penalty, compared to 2-up
- Color and Quality consistency and Machine Uptime
- Estimating that press could pay for itself in about 10 years
- Had to consider finishing- a B2 size sheet would've been nice, but our entire workflow would've had to change. We were already running 13x19.
- Had to consider putting a lot of "eggs into one basket"
- In-line booklet-maker wasn't realistic or justifiable

Bid Evaluation Process

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Evaluation Matrix:

Primary Press Bid Evaluation Matrix			Access Systems (Access Technologies Inc)		Canon Solutions America Inc		Eastman Kodak Company		Fujifilm North America Corp		HP Inc		Infomax Office Systems Inc		Konica Minolta Business Solutions USA Inc		Mark Andy Print Products (Mark Andy Inc)		Ricoh USA Inc	
	Evaluation Criteria	Weight	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points
1	Company's references, which demonstrate to ISU's satisfaction, that the equipment being proposed meets the requirements and will perform as described and responses/information obtained from references.	8	7	56	7	56	7	56	7	56	7	56	7	56	7	56	7	56	7	56
2	Warranty terms, provisions and options.	7	7	49	7	49	7	49	7	49	7	49	7	49	7	49	7	49	7	49
4	Company's compliance with the terms, conditions and specifications of this proposal.	10	7	70	7	70	7	70	7	70	7	70	7	70	7	70	7	70	7	70
5	Equipment design, construction, quality, features and specifications of the equipment being proposed.	9	3	27	9	81	6	54	3	27	6	54	3	27	7	63	3	27	3	27
6	Equipment capabilities and features.	9	3	27	9	81	6	54	3	27	6	54	3	27	7	63	3	27	3	27
7	Net cost to ISU, based on quoted prices, trade-in offers and Cost of Ownership.	8	9	72	7	56	6	48	5	40	5	40	9	72	5	40	5	40	9	72
8	Ink and consumable costs	9	5	45	9	81	6	54	5	45	7	63	3	27	8	72	3	27	4	36
9	Training and support offered	8	7	56	7	56	7	56	7	56	7	56	7	56	7	56	7	56	7	56
10	Ability to service equipment and technician response time	7	7	49	7	49	7	49	7	49	7	49	7	49	7	49	7	49	7	49
11	Service and Preventive Maintenance options	7	7	49	8	56	7	49	7	49	7	49	7	49	7	49	7	49	7	49
12	Company's ability to support migrating from current print technologies	6	7	42	7	42	7	42	7	42	7	42	7	42	7	42	4	24	7	42
13	Evaluation of on-site demonstration, output of provided test files and customer-supplied or brand paper (to be provided/required later in process to finalist)	8		0		0		0		0		0		0		0		0		0
14	Timeline for delivery and installation upon award	5		0		0		0		0		0		0		0		0		0
				542		677		581		510		582		524		609		474		533

Score Assignment	
10	Exceeds expectation
7-9	Fully meets requirements and/or expectations
4-6	Acceptable/Meets Requirements
1-3	Partially meets requirements and/or expectations
0	Does not meet requirements and/or expectations/non-responsive

Award Recommendation:

Printing Services would like to proceed with demonstrations of Canon VarioPrintiX3200 Inkjet Press

Rationale for Primary Press Bids not being considered further:

Access Systems (Ricoh):	High Click cost, Not Laser Safe Print (Not preferred print technology), Slow (less than required minimum ppm)
FujiFilm (Jpress):	Does Not Auto-Duplex, Max. Paper weight handling not sufficient
Infomax (Canon):	Not intended for primary press, slow (less than required ppm), not laser-safe print (Not preferred print technology)
Mark Andy (Presstek):	Does Not Auto-Duplex, not preferred print technology, longer setup time/cost
Ricoh (Ricoh):	High Click cost, Not Laser Safe Print (Not preferred print technology), Slow (less than required minimum ppm)

Finally Ready for Demonstrations

- **First demo was on live customer press a few hours away (November 2021)**
  - Present: Primary Press Operator, Production Supervisor and Director
  - Had the chance to talk to operators and owners
- **Second Demo was done at Canon facility in Boca Raton, FL (December 2021)**
  - Present: Primary Press Operator and Director
  - Setup and Ran our production files

Proposal and Awarding

- **December 2021**
  - After evaluations and demonstrations, it was determined the Canon VarioPrint IX3200 inkjet press was the best fit
  - A 5-page proposal was carefully written and provided, to get approval for a near $1-million purchase.
  - Email response within a few days… "Approved."
- **January 2022**
  - Purchase Order sent to Canon
    - Forecasted installation of mid-June 2022

Proposal to Purchase New Printing Equipment

By: Nathan Thole, Director
Printing Services- Iowa State University
Printing & Publications Building
2333 Kooser Drive, Ames, IA 50011-1099
tel: 515.294.0000
email: nthole@iastate.edu
Date: 12/10/21

To whom it may concern:

Summary:

Approval to enter into lease agreements for 3 new pieces of printing equipment, to be described in this document, is being requested. A summary of rationale and justification will be demonstrated. Overall, cost and production time will go down, while quality and consistency will go up. I'm seeking this approval as soon as possible, to ensure bid expiration dates can be met and to reap the benefits of the more efficient equipment sooner than later. Ideally, agreements would be signed before 2022. If more information or ROI calculations are requested, they are available.

Introduction:

Currently, multiple types of print technology are employed at ISU Printing Services, a unit that could be generally described as a medium-sized in-plant print provider. Much of the related equipment has been around for quite a few years, much of it beyond it's useful or efficient life. The primary point to be made in this proposal is that equipment updates need to be made to stay viable, due to increased cost and/or obsolete, failing equipment. This project was started prior to COVID, but the pandemic required us to put a hold on any new expenditures. Now, replacing that existing equipment is even more necessary than before.

Another intent is to describe and quantify proposed equipment, which can set up Printing Services to continue to succeed and improve products and services in the future. At the time of this proposal, demonstrations, testing and Terms & Conditions reviews, etc. are still being conducted, but if satisfactory, approval to award bids as soon as possible, is being requested. The investment plan for all equipment proposed is to enter into lease agreements, paid on a monthly basis.

Background on Print Technology:

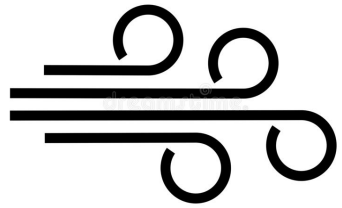
Offset printing is the oldest, current print technology utilized at Printing Services, which has advantages in large print runs and high quality. Disadvantages are, expert skill to operate and inefficient setup and waste, especially on small jobs. Trends have and continue to make this type of printing more and more impractical for much of our print orders and the printing industry, especially for a print provider of our size. Offset press operators are a very skilled set of laborers, and are getting to be very hard to find as well. ISU Printing services currently has 4 offset printing presses applicable to be replaced by the proposed new equipment. These presses could eventually

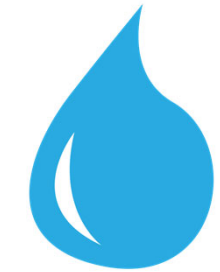
1

Installation Preparations

Things we had to consider, prior to installation

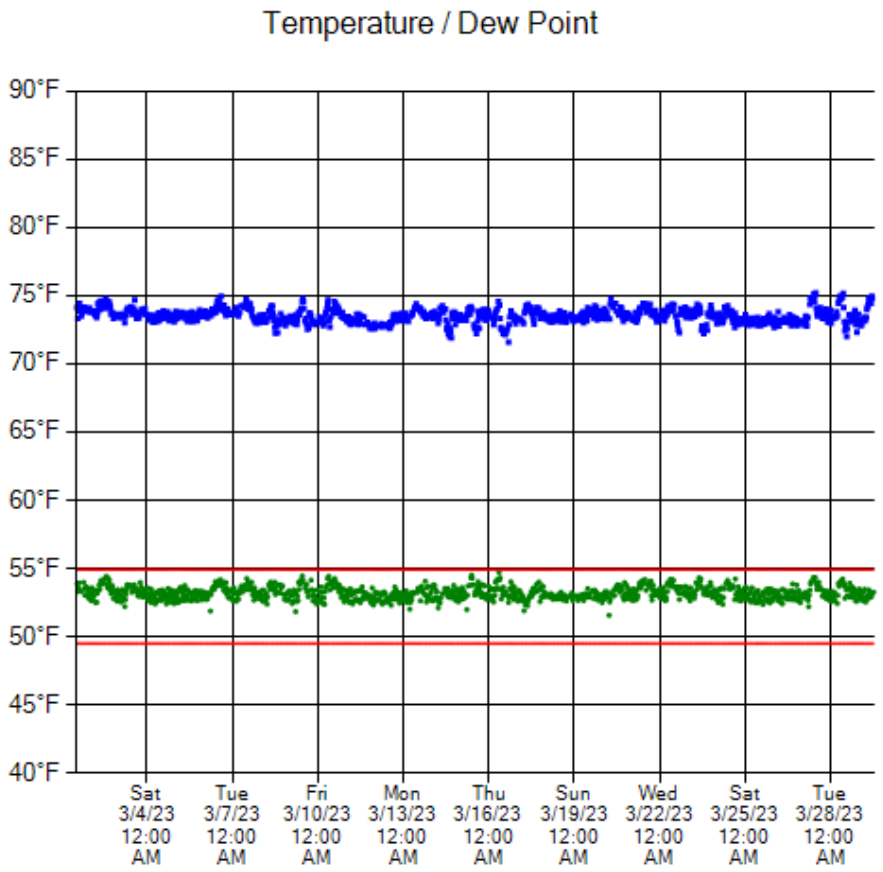
- Compressed Air
  - Our old compressor was about to die, so we installed a new one with redundancy to support new press, even if one pump went down.
- Reverse-Osmosis Water Supply
  - Our press requires super-clean water, so much that we had to run through a double-pass RO system.
- High-Voltage Electrical
  - We were lucky that our electrical infrastructure supported this new press, in addition to existing equipment.
- Exhaust System
  - Our press requires outside exhaust ventilation
- Floor Space
  - We are fortunate that floor space wasn't an issue
    - Ceiling height clearance came close!

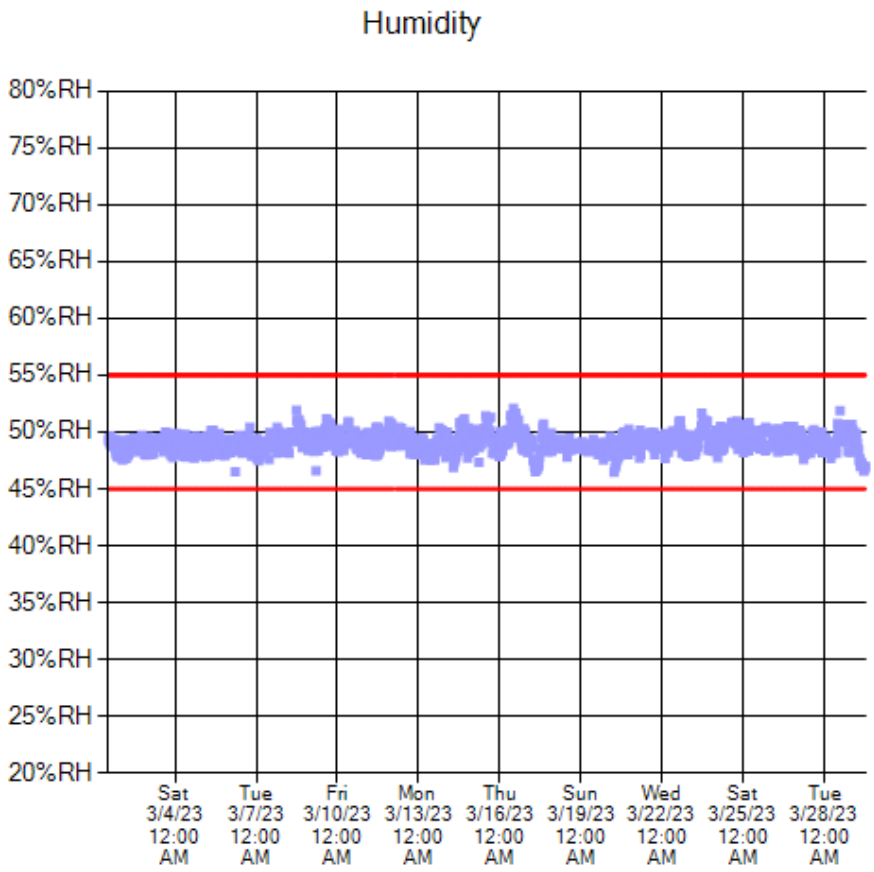




Installation Preparations…continued

- Humidity/Temperature Environment
  - We were fortunate that we had improved our building controls to provide consistent temperatures and humidity, years before.





What We Ended Up With

- **Canon VarioPRINT iX3200 Inkjet Press** *(installed June, 2022)*
  - **Replaced Kodak NexPress SX3300** (removed November 2022)
  - **Replaced (2) Heidelberg Speedmaster 52 offset Presses** *(have not run since June, 2022)*
  - **Replaced most volume from Konica Minolta Bizhub Pro1250** *(B/W Toner)*

Canon VarioPRINT iX3200 Inkjet Press

What Went Well

- Installation planning went about as well as could be expected. Install date was forecasted 6 months out, Canon hit that within a week.
- Installation was expected to be 2 weeks. We were running live jobs in 1 week.
- We were well prepared with utilities and environmental needs
- Timing- we were able to install during an optimum season for us

What We Would Do Differently

- Clarify media profiling and handling better- have all media fully profiled ahead of time.
- Clarify digital front-end software better up front-
  - we thought we were getting something different from what we received, even though we did demos.
- Factor in more cost for installation and environmental preparations.
  - This would still have been hard to forecast, considering our need to go through university facilities dept.

What We've Realized Since Install

- How much more efficient our workflow is now
  (example of busiest month)
- It took about 6 months to "work the bugs out"
- Quality is rarely a concern any more
- We now have extra capacity
- Have not fired up offset presses since…going on 10 months
- Finishing/Bindery transition was seamless
- We're able to promote VDP more, especially compared to offset
- A few minor challenges with media (synthetic, tabs)

Bonus Features

- Finish of the paper/media is honored. (see samples)
- Impressive resolution (Legible 1pt Font Sample)
- Able to print laser-safe product (versus toner)

Inkjet Envelope Printer

- **iJetColor Pro 1175P- Inkjet Envelope Printer** *(installed April, 2022)*

iJetColor Pro 1175P

- **Up to 10,000- #10 envelopes/hour**
- **Full-color**
- **Full-Bleed**
- **Variable-Data Capable, one-pass envelopes**
- **Has been replaced our outdated mail inkjet printer**

Iowa State University 100 Year 1922-2022 Anniversary Printing Services

Questions?