Introduction

In this lab we reviewed the gravure field trip at Lancaster. During the trip we visited two gravure presses which are the leaders in different sectors of the gravure industry. Writing this lab provided an opportunity to reiterate the knowledge gained from the field trip. I feel lucky to have obtained a chance to visit the gravure plants of leading companies and observe the practices carried out in real world industry settings, in person. My group has selected the topic 'Quality and Process Control' for this lab, where we shall be explaining the gravure industry activities observed at R.R. Donnelley and Armstrong, through the perspective of quality control.

Objectives

1. Describe the intent of Gravure Field Trip. Describe quality control and its importance in gravure printing industry.
2. Describe the R.R. Donnelley experience.
3. Describe the Armstrong experience.

Materials & Equipment

- Data collected from gravure field trip
- Gravure Research Library.
- Wally RIT Library
- Internet Google search engine
- Pentium Computer System
- Gravure Process & Technology textbook.
- Adobe InDesign CS3
- Lab 1, 2, and 3.
- Gravure Day presentations.

Objective 1: Gravure Field Trip & Quality & Process Control in Gravure

Gravure field trip is organized for the students to observe how the real world gravure printing is carried out in the printing industry. The role of gravure printing process in the graphic communication industry has always been important in certain sectors such as the packaging, publication and special applications. The field trip provided us with a chance to learn how the activities in gravure industry were executed. Moreover it must be stated that the field trip included the industries which are certainly the ‘best in business’. Gravure field trip intends to help students explore the opportunities in the gravure industries, in a subtle way.

Focusing on a specific aspect such as gravure workflows, sustainability, and quality and process control, was a good idea. It provides the students to pay attention to a topic of their choice. The topic chosen by my group was ‘quality and process control’

How is quality defined? Is it a series of manufacturing processes or sound business decisions that affect quality of the product provided to the customer? The real meaning of quality is a business definition that the quality of a product or service refers to the perception of the degree to which the product or service meets the customer’s expectations. In process control according to businessdictionary.com “Activities involved in ensuring a process is predictable, stable, and consistently operating at the target level of performance with only normal variation”. Process control usually in the printing industry is full automation of their presses which provides consistent operation at a
performance the company expects.

How is quality or target quality determined by who or whom? The easiest and most straightforward answer is the management! In quality the management helps define a set of rules and benchmarks for the company to follow to help exceed customers’ expectations. There are various management methods for having quality in their company such as Six Sigma or Total Quality Management (TQM).

Quality control in any printing process is of prime importance since these measures govern the quality and aesthetic appeal of the finished product. Any printing process needs to be controlled within specified tolerances for a specific aimpoint. If the process is controlled within a known range, then it can be regulated or altered to produce the desired result. A process with unknown and randomly fluctuating results cannot be regulated to produce the desired results. Gravure printing process is has several variable parameters right from cylinder manufacturing to finishing process involved those can influence the quality of the end product. Therefore, a controlled environment is highly appreciated for gravure industry. An uncontrolled process can nullify all the positives in a gravure printing process; for example, high quality substrates, expensive inks, and a new gravure cylinder would be unable to produce quality results if the process is uncontrolled.

Quality and process control in gravure printing process is attained by specifying standard / target values and certain tolerances for every process, and then attempting to hit the target values as close as possible.

Quality control in the pre-press workflow might be achieved by incorporating the use of press specific profiles. In cylinder manufacturing, high tolerances might be set for a dot area or cell volume. On the press, tolerances for density values are commonly utilized.

A few examples of quality control & process control steps or procedures, would be color management, soft proofing, hard proofing, cylinder proofing, cylinder examination, use of color managed workflows, use of application dedicated softwares, etc.

A gravure printing press can yield very high quality crisp images, with high contrast, and bright colors. But this would be of no value if the gravure press cannot repeat the same result even in the same press run. Such cases occur if the process has a large number of variables which are not conforming to the desired tolerances. Thus implementing quality assurance steps and procedures, process control is achieved. This is only possible by identifying the variables and taking corrective measures to overcome them.

Objective 2: Quality Control at R.R. Donnelley

R.R. Donnelley is North America’s largest provider of print and print related services. Apart from several branches in North America, R.R.Donnelley has several branches all around the globe located in Europe, Asia, and South America employing around 60,000 employees worldwide. The headquarters are located at Chicago, IL.

The Lancaster plant has web offsets as
well as gravure presses which are used to reproduce different print products.

In RR Donnelley's case they chose to use the principles of ISO 9001:2008 to manage Quality Processes and for the development, implementation and maintenance of effective Quality Management Systems. In order to have the quality management such as ISO 9001 to be effective managers should consider motivational strategies. Most of the time motivational strategies help employees become aware of what needs to be done and will help management achieve their goal. In RR Donnelly we saw an example of motivation which it states “Guess the number of plate repeats this year?” that type of motivation can help employees understand that we are doing too much plate repeats and we need to reduce that amount to help save the company money. In positive motivation to keep the employees motivated to keep quality at a high level there are incentives, bonuses, prizes or employee of the month which recognizes the worker for exceptional work. Motivation for quality can go a long way if management knows how to implement it correctly. Management can work extremely well in implementing quality for the company if it has the correct or the required technology to implement tighter and stricter rules.

From the aspect of quality control, it can be seen that the machinery they use are up to date, expensive and very quality oriented. To name a few, they have two cylinder engraving equipment which is ‘Hell K6’ with the NKI (New Klisch Interface) which is a well developed software for the engraver. They have 5 Cerrutis which are one of the most renowned gravure press manufacturers, and a new chambered KBA.

R.R.Donnelley has several robots those help manage the intra press transportation of heavy cylinders, from one place to other during the clinder manufacturing as well as carry them to and from the storage, and to the press. The press room robotics help save a lot of time and help achieve press automation.

The NKI preparation station is an important part of the cylinder making workflow. The software produces an .EDF file which is similar to a postscript file which carries all the engraving information. From this file a hard proof of real/original size is printed and then color correction is carried out and only then the cylinder is engraved.

The ‘Cell Guard III’ software takes control of the workflow after this step. This calculates the depth and cell volume and tries to achieve it automatically in 10 attempts. If it is unable to achieve the target values, it goes in the manual mode. It has been experienced that the software achieves the target values in 3 to 4 attempts at the most. Once it is done, it prints a detailed certificate for every cylinder which are stored for future re-engravings or as an evidence of meeting target values.

During cylinder engraving, the copper hardness, ductility, and conductivity is frequently monitored.

After the cylinder is engraved, chrome plated and polished, a final visual check is done to check the cell integrity. Quality of the cells also depends on the diamond stylus, thus a count of engravings performed by a particular stylus is monitored and the stylus is changed after every 200 engraving hours. Cylinder correction is therefore prevented by following all the previously
mentioned quality control steps.

On the press, the ink is auto-replenished as per the requirement to maintain a specified viscosity. This is done by InK Recipe Control software which regulates the ink formulation by adding solvent, varnish or in the ink concentrates as and when required.

Thus learning about quality and process control measures during the visit at R.R. Donnelley was a good experience.

**Objective 3: Quality Control at Armstrong**

Visiting Armstrong was a very interesting & an unique experience. Armstrong prints ceilings, floorings and wallpapers which fall under special printing category.

In Armstrong flooring, the management also follows ISO 9002:2008 for quality management and they also have a website dedicated to sustainability to reducing environmental impact and improving quality. Technology today plays a big role in quality control, as mentioned before. Before the advent of computers it was difficult to maintain high standard of quality such as prepress workflow and engraving the cylinder. Now in RR Donnelly and Armstrong flooring the use of technology in quality is really amazing. Almost everything in the press room is automated to keep the plant running smoothly and helps reduce the number of worker accidents and fatalities to nearly zero. The use of robots in engraving helps bring precise engraving on the cylinder and it rarely makes a mistake so that is quality right there.

For the first instance it might feel that they do not implement much color management or any quality control procedures, but after the visit, it was apparent that their designing and prepress procedures involved critical color management and color selection steps that ensured an as natural as possible look to the product. industry.

Any natural pattern of woods, stones, planks etc. were photographed by a very high quality ‘Cruse’ scanner which provided raw files to the user. These were then converted to multichannel images and each channel was commonly replaced by a special spot color.

All the products printed at Armstrong make use of spot colors since it is way too easy to control the printing process and keep obtaining repeatable results, as compared to the use of process CMYK colors. Although with the spot colors predicting the overprint is not very easy. For this purpose Armstrong use a special software customized for them, called as AVA.

The AVA software uses the colors specified by the user, thus in this case the colors were the ink recipes available with Armstrong. In this way different color combinations could be previewed. A team of designers would then decide the spot colors those produced the best appearance of that image.

Once the colors were decided, the image is proofed with an large format inkjet printer which provides a better feedback of how the image looks. The team of design members then decide if the product should be launched or not.

Sometimes a small quantity of the product is launched to statistically verify the success
of the design and then it is mass produced. In certain cases, a special gravure plate proofing machine is used to derive the exact color reproduction.

Once the design has been approved cylinder is made and visual checks are made to verify cell integrity and printing is carried out. The inks are made off press based on calculated recipes and using a K-proofer, they are verified for a visual and a quantitative check before feeding on the press for production. Few people are always checking the prints for defects and undesired print artifacts, while the press is running.

When all these quality control measures are followed it ensures quality product and least problems on press.

**Personal Reflection:**

**Anupam Dhopade:** This lab made us review the experience of Gravure Field Trip at Lancaster. It was a good idea, because this brought our attention to how important different aspects of operations in a gravure industry were. Working with Joe was a good experience. Thus to conclude, it was very different approach for a lab, but an interesting one!

**Joseph Vetter:** The field trip to RR Donnelly and Armstrong Flooring to Lancaster, PA was a very interesting experience. I enjoyed learning how the real world Gravure printing works and how the people in the plant are able to maintain quality through different sets of methods. Both RR Donnelly and Armstrong have different methods of how to run their Gravure presses and what their expectations are. Working with Anupam was a pleasant experience for doing quality control for those two respective companies.

**References:**