Competence Training in the Printing Industry: the key ingredient for optimal workflow management and standardisation

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Keywords: Total Quality Management, LEAN-manufacturing theory, 6 Sigma, Process Standard Offset (PSO), G7® Master Printing, Process Standard Printing

Successful printing companies must satisfy two basically contradictory requirements, namely bringing for cost reasons the cycle times of production to a minimum and maintaining the quality at a precisely defined and constant level. This goal can only be achieved through the rigorous use of modern management theories whose success must be made visible by certifications as an incentive to the employees and as a marketing tool to the customers in a highly competitive global market.
The process of implementing optimisation projects for the printing industry is lengthy. This is a period of time, however, is superposed on a constant phase of development, in which the employees' competence requirements are changing drastically and will continue to change even more in the future. This paper outlines a relevant critique on how companies understand the workflow process standardisation, employees' needed training goals on how to apply the standardised manufacturing processes, and, as a successful conclusion of the standardisation project, the target of FOGRA Process Standard Offset (PSO®) certification, or equivalent, of their manufacturing process as a proof of manufacturing quality excellence. To establish a proper education that also supports the industry management theories, it is hereby recommended joining the forces of the various different countries with an aim of bringing more young people into vocational education and training (VET) or higher education institution (HEI) study level of the Graphic Industry, and to train in anticipation already young specialists in modern print manufacturing theories and practices. This aim requires us collectively to improve the existing curricula by including industrial manufacturing theories, in order to avoid spending double resources and to support each other's efforts, so that we can keep VET, HEI and the printing industry sustainable. In this paper we will describe some examples from signed-off experiences whilst implementing at the printing industry level standardised workflows and quality control routines.

1. Introduction

During the lengthy process of implementing optimisation projects for the printing industry, which itself is in a constant stage of development, the employees' competence requirements have already changed drastically and will continue to change even more in the future. The emergence of various new technology "trends" often introduces a misleading image of where the printing industry is moving. In order to secure the sustainability of the printing industry, should be introduced the most important potentials for future production already in the early stage of industry developments. This preamble to the paper will introduce key-points, trends and provide relevant critique on how companies understand the workflow process standardisation, employees' training goals on how to apply the standardised manufacturing processes, and, as a successful conclusion of the standardisation project, FOGRA Process Standard Offset (PSO®) certification of their manufacturing process as a proof of manufacturing quality excellence.

Some of the European Union (EU) member states' printing industries, due to economic reasons, misleading propaganda or an insufficient competence level are unable to provide support for the standardisation projects for industrial manufacturing or to implement the Total Quality Management, 6 Sigma and ISO standards-based quality programmes on a higher level. Often, due to the lack of modern manufacturing theory and competency subjects at vocational education and training (VET) or higher education institution (HEI) level, the employee's trainings for the 5S, LEAN-manufacturing theories

[3] will start only when in industry, at which time the personnel characteristics are already established in the individual respective fields of printing, bindery etc.

To establish a proper education that also supports the industry management theories, it is recommended joining the forces of different countries with an aim of bringing more young people into the VET and HEI of the Graphic Industry, and to train already young specialists in modern manufacturing theories. If we can, all together, improve the existing curricula by including industrial manufacturing theories, then we can avoid spending double resources and support each other's efforts, so that we can keep VET, HEI and the printing industry sustainable. In this paper we will describe some examples from undersigned experiences, how to implement at the printing industry level standardised workflows and quality control routines.

Based on field experiences we have to look as well at the comparison of two printing industry quality methods:

- PSO used in EU and near global markets
- G7® Master Printing certification is used generally in the US and near global markets.

The standardisation methods of both leading organisations FOGRA and IDEAlliance include the best of their competencies. After implementing the standardisation routines (for example 5S, total quality management (TQM) etc.), the industry will have the potential to continue their process optimisation projects at the higher level, enabling the fine-tuning of the manufacturing routines toward PSO certification. Even by implementing developed manufacturing theories, it is not/will not be possible to replace the manual working competencies and skills that are required in order to work with high speed and with info technology (ITC) computer based machines in a company in accordance with job profiles and working place discipline, exactness, teamwork etc.

2. Problem definition

Common standardisation theories are mostly based on offset print technology in the field of media content or civil production. Due to the trend toward reduced length of print runs within traditional offset, production is quickly changing its focus to digital output devices or other printing technologies as well flexography, rotogravure etc. Some poorly focused assessments concerning the future trends of the printing industry, based adversely on technology "hype" are leading to the reduction of VET courses, resulting in the closing of well operating departments. Even worse is the frequent misleading of young people with the teaching of erroneous information stating that the printing industry leads to a heavy load and stress on the environment. To promote recognition of the changing trend of the printing industry, rather than a static leviathan, we should focus our standardisation routines as well as on sustainable printing technologies of packaging printing, printing on challenging substrates and giving generally high value for ITC and to the printed products, the electronics, diagnostics, pharmacy industries etc. Packaging and multi-technology printing will keep the production of print sustainable for the long term. As our studies have shown, all printing industry fields are in need of broad-minded specialists to be able to manage complex standardisation processes, and follow them up on a day-to-day basis in both manufacturing and operation.

To become a certified printing company is in reality not very difficult! It requires the ability to undertake a process analysis, understanding the process behaviour, envisioning the results of defined actions, teamwork, willingness and, above all, the vision to initiate it. To remain a certified service provider during the everyday production routine is, however, a much bigger challenge and requires lot of best practice implementations and continual optimisation. Due to the conventional nature of the printing process nature and the fluctuations occurring during the process, it is vital to implement appropriate modern manufacturing routines to provide the security of a stable, predictable and efficient production. In

this paper we will analyse the possible drawbacks if the manufacturing process is not sufficiently stable due to the material environmental changes and the lack of competence to foresee the possible causes and results. Thus, the major issue is to keep production predictable and repeatable day-after-day. This requires a regime of follow-ups and continuous detailed process analyses. Often the misleading conclusion one hears once problems arise is that the issues in the production workflow are such that they lie beyond press operator control, for example in prepress output files, plates etc. In modern manufacturing process routines the bigger picture must include all process details, materials and a thorough dialogue between the different partners contributing to the according standardised, predictable process conditions and improved control during the time frame of the manufacturing, i.e. real time feedback involving all the operator control systems and the stakeholders in the process. To enable this, the first level of the monitored manufacturing process has to have at least a minimum contribution made by modern manufacturing theories and controls set-up. Without full production flow management from in-put to out-put the problems occur more easily and the promised quality target certified will be a major problem to achieve.

3. The process

(I) pre-analysis, obstacles, challenges and needs

In this paper, we wish to start the discussion about the first level of the standardisation project in the printing industries, going through the implementation of the LEAN-manufacturing and 6 Sigma theories and finalise the project with the PSO or G7 certificate.

A modern printing industry needs to optimise and standardise their production workflows not only for quality reasons on long runs, but also due to the demands of reaching quality equilibrium early in shorter runs and increased competition on globalised markets. Today's common problems within the printing industry are caused by wrong or inconsistent day-to-day production routines. These may be human caused or arise from technical problems occurring during the production, and quite frequently an inappropriate steering response to the technology fluctuation made by the operator. Exemplified by experience out in the field, the following will describe some problems and obstacles that are common in the areas where we have been working.

Often, the start-up project at a printing house to standardise the production flow will not get finished. This is generally due to the following show-stopping issues:

1. Company has to make hard decisions to change company philosophy
2. Management and employees need to start thinking "out-of-the-box"
3. Necessary to design training programmes for employees and management
4. Need to recording the real starting point situation and values prior to the project launch
5. Make the analysis of the key values and technology processes
6. Design for the everyday routines and follow up programmes
7. Implement best and suitable manufacturing theories and practices
8. Adopt competencies inherent in the manufacturing theories and practices for the everyday production
9. ……..

Whilst the above points relate primarily to the challenge of having good management in place, the disappointment is even greater when we see that many companies whose management teams start the projects achieve some commendably good results, but when it comes to making the process the basis for everyday routine in the manufacturing, only a few can go on to reach the final goal. Therefore, already during the early studies at VET and HEI stage, students must be trained and taught to the highest level in progressive manufacturing theories. During the studies one has to understand the complex crosslink between manufacturing theories

and printing standardisation according to ISO12647 standards [2]. After graduation, the young specialist can support the company management with the expertise in new ideas and become the future leader who implements subsequently the LEAN-manufacturing theory and champions the quality of the printing processes by PSO certification [5].

The general goal for standardised manufacturing is to speed up the manufacturing process whilst marinating quality reliability. The printing industry today is defined as the global business without regional limits, in which every company is facing the globally controlled quality demands and reduced cycle times. On the one hand, this makes the companies attractive for global customers, but, on the other hand, it makes them vulnerable due to the higher stress of manufacturing, where people start to make mistakes, lose focus and deliver unstable variable quality products. Due to the nature of the printing process it is never 100 % stable – this applies to all printing technologies! This challenges the technology engineering staff to develop responsibility and exclude as far as possible any variations, or fix them during the value chain standardisation project. The ultimate goal of industrial operation through this action remains to reduce costs and increase profitability!

The LEAN theory stands on 5 basic pillars:

1. Printer-customer relation
2. Identified process value chain*
3. From push to pull process systems
4. Improved process flow*
5. Continuous improvement – everyday routine*

Through this document we shall focus only on the pillars 2, 4 and 5 marked with an asterisk*, since these relate to both PSO and G7 process standardisation, and feature within the guiding help of the 6Sigma and Total Quality Management practice.

One of the major customer-defined priorities is quality. The classical definition of industrial quality is, "the quality that is accepted by the customer". No more, no less! The printing industry is dealing with quality complaints, product returns, price reductions etc. These are nowhere more strongly felt than in packaging printing. To manage all these limitations and ultimate stress, the best way to solve the problems is to standardise the total value chain, using progressive manufacturing theories, to train employees and evaluate their competence based on the resulting new job profiles and appropriate working conditions.

The target for process mapping and optimisation shall be clearly stated as Process Standard Printing. In modern industrial understanding we shall target our goal NOT only in the direction of offset printing processes, but as well toward other printing technologies. The basics can be taken from well-established offset methodology (example: Process Standard Offset [PSO] [6]). The accepted and qualified certification methodology has been developed only for offset printing, i.e. G7 and PSO, but, beyond that, the other conventional or digital printing methods can be aligned with ISO standards and technological requirements to meet proper visual results.

The modern printing industry value chain starts usually from the input files. This is where the current misleading information around the market impacts negatively, that the print operator does not have the control over the input files [1]. If we are dealing with the standardised value chain and industrial manufacturing, then the ISO15930 and ISO12647 standards requirements will lead to the identification and management of the quality level of input files. They are easy to check and analyse via pre-flight software or automated "hot folders". This is a valuable starting point, due to the fact that every pixel will be aligned according to standard requirements inside the input data. This is nothing more than the classical dialogue between print and prepress operators, but now via an adjustment at the software interface. Beyond that, general CS (Adobe® Illustrator®) settings will include the necessary ICC (International Colour Consortium) profiles during the file generation, which has to secure the first level quality assurance.

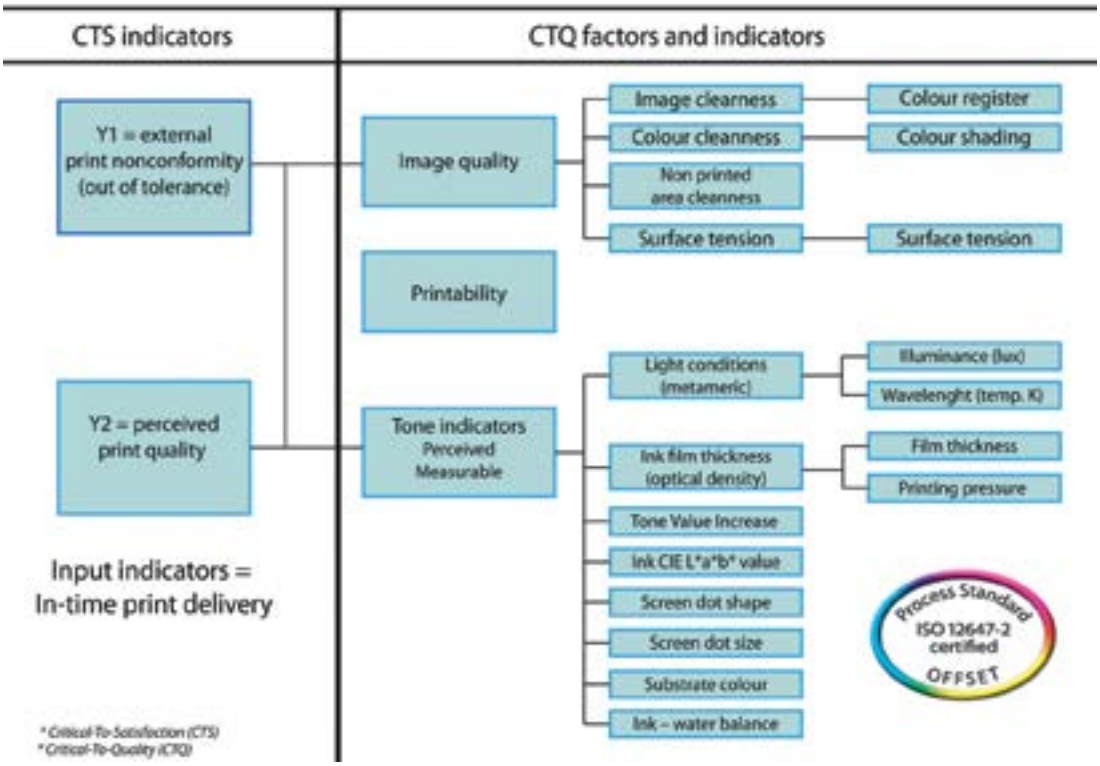

Figure 1: 6Sigma process table to secure the PSO certification (AS Metaprint) [5].

From the experiences in our files, printing companies often state on their web-sites, "For file preparation please use the common ICC profiles (example ISO_coated_v2.icc)," but in many cases at the printing machine the used inks do not meet the required CIE L*a*b* solid ink values! To solve this we are led to using the standard Value Chain Mapping requirements:

- View the entire Value Chain with all details included
- Design value chart with material and information interactions
- Define the non-value actions and sources
- Define the problems and design the improvement plan
- Discuss and keep dialogue open with all value chain members

The important part in guiding the printing industry is the integration of the 6Sigma. The 6Sigma alone is not in every case the ultimate speeding up tool, and does not always have the influence desired on overhead costs. However, a LEAN theory requires a high personnel cultural level of understanding and involves active participation of the company top management to avoid the failure of the efforts being invested. This has to be taken into account in the early stages of the project, so that the process is one of change and standardising activities that will be started right to the top level in the company to avoid unnecessary later misplaced criticism or destructive feedback. The first stage of the designed printing industry improvement shall therefore be started from the standardisation of the general value chain, and only secondly end up as a certified ISO-printing process.

The first stage of standardisation for the printing industry can be the same for both of the standardising methods (PSO or G7), being focused on the printing quality variables and defining them during the 6Sigma "Define - Measure - Analyse - Improve – Control" (DMAIC) design. By implementing into the everyday routines the 6Sigma DMAIC production quality will be predictable and controlled. Every event can be traced down through the process to the bottom level and analysed. The helpful tool on offer is to design the balance scorecard with cycle time and all measurable values. During the process, created waste or nonconformities must be recorded, analysed, translated into an action plan and tested again.

The final goal of the LEAN and 6Sigma activity remains to end up with standardising the printing process. Depending on the printing company location, there exist two general methods in the market:

1. PSO used in Europe and through FOGRA PSO partners on other continents;
2. IDEAlliance G7 used in US and through IDEAlliance G7 partners on other continents.

Both methods have the same goal – to standardise the printing process and secure the day-to-day predicted and controlled production quality.

From the marketing viewpoint, often representatives for each method try to show benefits of one method over the other method and this is understandable in respect to gaining sales. From the viewpoint of the physics and visual perception, however, both methods are equal in achieving the final result and quality.

During the LEAN and 6Sigma projects, one is naturally already solving value chain problems and setting up optimised workflows as well as optimising the printing technology and print environment simply following the ultimate goal of the project to reduce costs and increase profitability. This is all achieved with the help of the resulting agile production and predicted quality. The critics often say, that introducing a standardisation process makes the end product similar to all printing plants, and as a result we lose any unique perspective or desirable fingerprint in the production. In earlier days, as printing was more a craftsman-controlled production where every master added his personal touch into the end product, such a statement might have had validity, but today agile and industrial manufacturing has to be quick, flexible, profitable and formalised, such that there is no space for a print operator's personal touch, when having to be within the margins of best tolerance and stable quality. A niche printing house, however, need not be excluded, if a special run is required with a personalised "touch", as it simply needs to be run under predefined tolerances, which themselves can be unique. To achieve the results described above, it is necessary to improve the production value chain and keep in mind the final goal to certify the printing workflow according to ISO12647. This is to prove the company competence, to provide a security of the delivered quality and trust in the product being delivered to the print buyer.

(II) methodology: achieving the standardisation goal

The comparison throughout the certification development is made by considering the process steps, presuming that the printing press is in proper mechanical and stable condition. The input data are in digital form, and when in accordance with ISO15930 standard requirements we can state that the data set is under control. Before the document to be printed will be processed, the PDF/X quality will be checked and/or corrected to meet the ISO12647-2 standard printing requirements. To achieve this, we compare the process steps needed to reach the required colour quality of printing under the ISO12647-2 standard. The standardisation of the process means that the printing company will set up some limits that are derived from ISO12647-2 regulations. By choosing the substrate quality we align the requirements according to the description in the standard and in this way follow the impact of the substrate physical properties. If, say, one of the values in L*, a*, b* are lie outside the border limits of the ISO12647-2 standard, then the risk of nonconformity in production is inevitably present.

When providing a modern printing service, the paper/substrate is often part of the print provider's responsibility, and in these cases the substrate white point CIE L*a*b* values are respected and inbuilt as the first step in the exercise. In the case where a customer likes to have a different quality of substrate lying beyond border limits, the standard process per se is not fulfilled. In this reported comparison, therefore, we exclude the case of nonconforming substrate, and in this case in the comparison we label conforming substrates as Paper Types 1 and 2. According to our certification experience on the same Paper Types 1 and 2, the CIE L*a*b* target values can be used additionally for the standardisation of non-paper substrates with the similar white point values as Paper Types 1 and 2: exemplified in our chosen special case, the white point was L*-91,8; a*-0,3; b*-3.

The next, and second valuable step is the proper choice of CMYK printing inks. According to the existing ISO2846-1 standard, the printing ink tolerances are extremely wide and often do not correspond to the ISO 12647-2 standard colour set requirements. CMYK ink providers in the EU frequently supply specially mixed ink-sets especially for the PSO standardisation process, delivered with the special marking: "PSO applicable". From experience, the supplied ink sets are, nonetheless, still lying far away from the target values, depending in practice upon the nature of the substrate and allied printing behaviour. In cases like this, solid area ink CIE L*a*b* target values will already have a too large ΔE and altogether accumulate to nonconformity of the pre-estimated print production. During the LEAN documentation and application of the 6Sigma production process, value chain-mapping dialogue between print and ink provider is essential to set-up proper CMYK ink set quality conditions. This is a prerequisite requirement. After establishing the ink pre-set requirements, the 6Sigma concept of DMAIC will secure the predicted and stable ink quality for the daily business.

When the pre-conditions described above are fulfilled, only then is it reasonable to start to fine-tune the ISO12647-2 standard target values. To do this, we refer to measurements made on black backing.

From the ink and substrate point, both standardisation methods are starting from the same level of adjustments:

PSO – SOLID CIE L*a*b* value adjustments (ISO 12647-2 aim targets) [2].
G7 – SOLID CIE L*a*b* value adjustments (ISO 12647-2 aim targets)
Limit acceptable is ΔE <5.

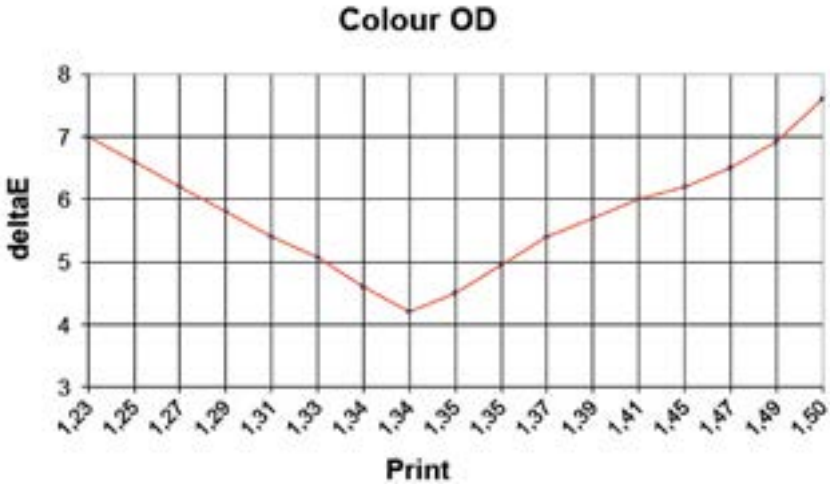

Figure 2: Solid area CIE L*a*b* value adjustments (ISO 12647-2 aim targets) for the print colour optical density space and acceptable ΔE

Based on the CIE L*a*b* the fine-tuned ΔE results can be fixed through the required solid ink density (SID) values, and the SID has a direct influence on the image visualisation quality, i.e. on the image components on the substrate. Due to the physical printing pressure, ink film thickness and optical influence arising from the screen dot size, this resulting influence has to be modified according to the ISO12647-2 standard tone value requirements.

Solid tone colour OK Print on Black Backing

Bottom left	Actual			Aim			ΔE*ab	
	L*	a*	b*	L*	a*	b*		
Black	16	0	-4	16	0	0	4	OK
Cyan	55	33	-51	54	36	-49	3	OK
Magenta	46	71	-1	46	72	-5	4	OK
Yellow	86	-3	88	87	-6	90	4	OK

Deviation tolerance: 5

Bottom right	Actual			Aim			ΔE*ab	
	L*	a*	b*	L*	a*	b*		
Black	16	0	-4	16	0	0	4	OK
Cyan	55	33	-51	54	36	-49	3	OK
Magenta	45	71	-2	46	72	-5	4	OK
Yellow	86	-3	87	87	-6	90	5	OK

Deviation tolerance: 5

Top center	Actual			Aim			ΔE*ab	
	L*	a*	b*	L*	a*	b*		
Black	16	0	-4	16	0	0	4	OK
Cyan	55	34	-51	54	36	-49	3	OK
Magenta	46	72	-3	46	72	-5	2	OK
Yellow	86	-3	87	87	-6	90	4	OK

Deviation tolerance: 5

Mean colour values of the secondaries on black backing (informative)

Bottom left	Actual			Aim			ΔE*ab	
	L*	a*	b*	L*	a*	b*		
Red	46	65	45	46	67	47	3	OK
Green	47	-63	24	49	63	26	3	OK
Blue	21	23	-43	24	21	-45	4	OK

Figure 3: Solid area CIE L*a*b* value adjustments (ISO 12647-2 secondary)

If the raster image processor (RIP) tone value increase (TVI) corrections are made correctly, according to the aim/target value table, and have left a sufficiently large working window for the print operator, then the colour gamut will map according to the FOGRA characterisation table (example: Fogra39). During this process, the technology engineers shall direct all their efforts, based on the local conditions, to achieve the ISO12647-2 standard aim values. Based on the ISO12647-2 standard, one must clearly differentiate the tolerances used for the fine-tune quality requirements in order to generate the contract proof versus those during the production run.

TVI correction as defined within ISO12647-2 is according to the table for Paper Type 1 and 2 (CMY 40 % max 13 %; K40 % max 16 %), with G7 – stated as secondary variable ISO12647-2, +/- 4 %.

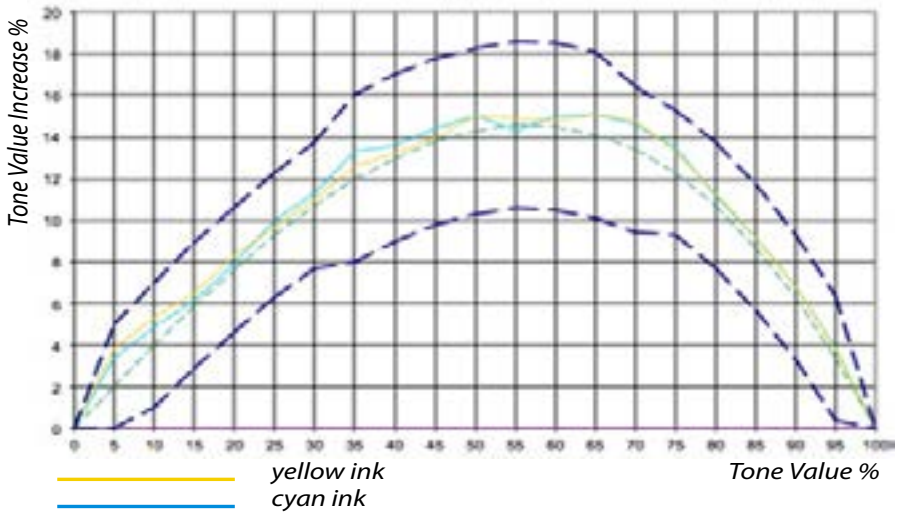

Figure 4: TVI – ISO12647-2 according to the table for Paper Type 1

The employees who are involved in the standardisation project must have the competence to understand how the human perception is working via the eye construction of vision. For example, why it is more sensitive to CIE b* value linear change than to the influence of CIE a* value change. This perception is controlled by the balanced grey during our certification processes with the proper RIP curve settings, will be within tolerances set for visual observer conditions under the K5000 condition, and measured via OD comparison between the target patches on the printed colour bar.

The next challenge at this point in developing toward the FOGRA characterisation table aim values and proper colour gamut is the calculation and iterative modification the RIP curves. Both standardisation methods are working via RIP settings to secure the production quality. In the PSO method, the RIP curve calculation is open for the technical staff to do, and it is possible to achieve the desired results with simple mathematics and an understanding of press behaviour. In the G7 method, on has to use a specific software tool to shift the curves of CMYK, which makes the process less transparent unless fully understood, which can lead to initially wider fluctuations for the inexperienced player. With training and experience, however, to set-up the standardised conditions during the project is not so difficult, but more difficult is to keep the production value chain working with maximum stability while adhering to the tolerances. The grey balance working environment is the quickest visual indicator to visualise the printing process fluctuation and to identify unexpected causes of faults arising during the press run.

In both methods PSO and G7 tools are valuable to assist in achieving the correct and stable grey values as closely as possible, and to monitor them over the ISO12647-2 standard CIE L*a*b* target value requirements. Thus, combining the ISO12647-2 standard aim values in respect to CIE L*a*b*, SID, TVI, the standardised printing process can be set up. To make the grey fine-tuning by the G7 method, the additional software tool must be used. In the PSO, all grey fine-tuning can be done using the standardisation team competence and knowhow. If the grey areas have a large per cent content inside the image area and the substrate CIE b* value is out of the ISO12647-2 standard conditions, then the additional help from the G7 grey balance software can reduce the time consumed to achieve the desired results. If more detailed fine-tuning must be implemented then the end result itself must support the visual perception comparison or the substrate printability properties are out of the standard conditions.

To keep the value chain under control during everyday production, it is not enough to use only PSO or G7 methods, but it requires the full combination of the LEAN, 6Sigma and Total Quality Management to be implemented to extend the security attained by implementing the PSO or G7 achievements. The general goal for future operators must be to become creators and to bring creativity into the industrial manufacturing routines in order to build up and inspire well-motivated teams keen to achieve the highest standardisation in quality and to achieve a production stability ethic.

4. Discussion

Tomorrow's print operator must have strong competencies in both printing industry technology and good manufacturing workflow. These competencies will become even more closely linked to the management of industrial production flows and of the production process. The purpose of developing and continuing to provide an updated higher level education curriculum together with LEAN management is to make the overall printing industry market attractive to young people and inspire them to exchange their knowledge with each other, and so allow it to retain and extend its rightly valuable role in cultural communication and transactions.

We are the generation who got our first sense of competence under the illusion of stable social conditions. In the future, however, we shall come to understand that rapid change becomes the norm in our mind. Our world has changed during the last years from an industrial society with prosperity and

material things into a knowledge-based economic society concerned with self-realisation and experience. These changes mean VET instructors face a new task. Their knowledge and teaching methods must be continuously adapted to modern industrial theories and practices. This may require learning new manufacturing skills at university level. To complement the instructor development, expectations for the print operator are: a coherent attitude toward and understanding of new manufacturing theories, a willingness to change and be creative in an environment of improved workflows, and to act within a unified team, whilst retaining the ability of systemic thinking. Thus, they should enquire of themselves: how can I contribute? – how can I help define and influence strategy? – what should be my practical actions?

To enable the above to become reality, we have analysed and compared two certification processes, which not only act as tools to achieve an improved product and production quality ethos, but provide the operating environment for creative feedback in the process to target further optimisation. Both certifications will contribute to the final programme competencies that will support the growth of the industry knowledge. By using modern training methods, tools and learning environments, employees will have future-orientated competency courses, in which the practical work should reinforce the knowledge and skills from the training, and show how these can be used to keep real world tasks stable and within high quality requirements. Following training to achieve these goals, the manufacturing team must bring to the process the best competencies that they possess. Thus, we must lead young learners to work internally with self-discipline to develop those competencies during their life-long learning cycle. We must give to employees on their career path the knowhow that is needed, and prepare them to make the fundamental changes that the global economy will demand or require.

The new generation of manufacturing employees emerging from a strengthened advancement-training environment will support the overall efficiency of the industry by applying their competence in hi-fi production management theories, and by applying their understanding of the full workflow concept to the printing industry production. Strong printing technology competence makes companies more robust and encourages the industry to make hard decisions on fundamental changes of everyday routines, habits, traditions etc. Today's working specialists, who are graduating from VET or HEI studies, should be equipped with the additional competence to motivate and coach their team members to make changes. Agility and change will be part of our everyday life in the future. People in modern organisational structures need to be more involved in decision-making and in the process of transforming the organisation from the old "push" conditions to "pull".

The printing industry will continue to meet new ideas and challenging concepts, and company management can respond by utilising the competence of young printing operators in developing and adapting everyday production operations. Thus, the market will have printing operators with stronger competitive input – and this will feed back into vocational education such that it will be much stronger than it is today. With this approach, the printing industry will give to the labour market a strong positive sign that printing has much more to offer in future – it will make printing attractive as a career and maintain its attractiveness to the recipient of printed matter.

5. Conclusions

The paper outlines the value for the printing industry resulting from standardisation. It highlights also the need for employee competence quality and operator training to develop the skills to support the future for the cultural advancement in printed media, and argues strongly for unified commitment to achieve this vital development.

In addition to the needs for well-trained motivated operators and team agility in the workplace, the two standardisation norms, PSO and G7, are presented

in parallel and their common principle described. It is shown that the grey balance is the basis for the overall process, and it is fine-tuned using the TVI (tone value increase) adjustment inside the RIP settings, which are in relation to the ink film thickness, substrate behaviour and printing press conditions. The TVI is adjusted and monitored on the full tone dot size reproduction area. This approach is needed due to human visual perception, i.e. the neutrality of grey has to modify in relation to the observer viewing conditions. The modern calibration and process standardisation methods using CIE L*a*b* colour aim/target values, tone value curve and grey balance adjustment methods both can guarantee ISO12647-2 conformance results.

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