UTILIZATION OF CAD/CAM TECHNIQUES IN PRINT-WORKS IN CZECH AND EGYPT REPUBLIC

الاستفادة من الحاسب الآلى فى مجال طباعة المنسوجات فى مصر والجمهورية التشيكية

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الخلاصـــــه :ـ

فى السنوات الاخيره لوحظ استخدام الحاسب الالـــى فى صناعـــة النزل والنسيـــــج والملابس الجاهـــــزه ، ويحتوىهذا البحث بتطبيق نظـــام CAD/CAM فـــى مجال طباعة المسوجات مع اجراء مقارنـــه بين كل من جمهورية مصر العربيه والجمهوريـــــه التشيكيـــــه فى هذا المجـــال .

كفاء تطبيات التشغيل ـ التكلفـــه ـجودة المنتجات يمكن أن تتحسن بشكل ملموس باستخدام الحواسب العاســـــبه .

ABSTRACT

In recent years we have observed widespread applications of CAD/CAM (Computer Aided Design / Computer Aided Manufacture) systems in different sectors of the textile and clothing industries. Textile printing is no exception. The level of sophistication and associated costs involved in implementing these techniques can vary enormously, but they offer improvements in process efficiency and costs, greater flexibility of operation and improved product quality.

This jointly - presented paper aims to initially review the use of CAD/CAM with specific reference to screen manufacture / engraving, print machine automation / control, and print paste dispensing systems.

The authors will evaluate the extent to which this technology has been implemented in both the Czech Republic and Egypt and will discuss future trends within both of these countries.

1. INTRODUCTION

The basic desire of human being is to make textile fabric beautiful and attractive by producing colourful designs on it with various colours. This is an art which is beign practised since ancient times. This art-"dyeing of textiles in boundaries "or" localized dyeing" is known as printing. Thus to-days printing processes are result of decades of practical experience.

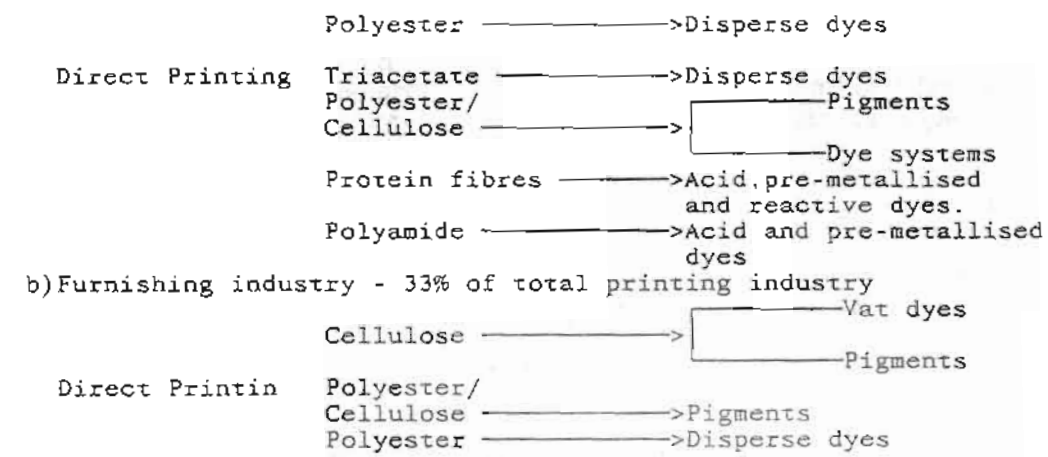
The textile printing industry is like no other in the textile world for its complexity and the use of so many specialist skills: from the initial designer, the engraver, the skil of the printer, the colourist and chemist who develops the special chemical methots, all of which enable the design concepts to be achieved on fabric. Prints are used in work wear, houshold goods, fashion goods and on all fabric bases from the highest quality of silk to basic commodity cotton goods.

1.1. Identifiable Industry Segments

The textile printing industry covers the following areas:

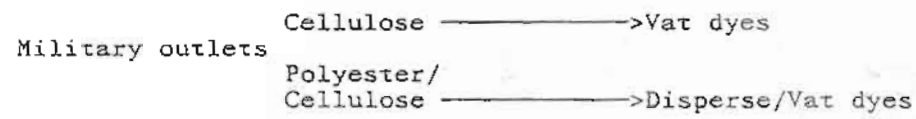
a) Apparel industry - 56% of total printing industry.

Cellulose ——————> Reactive dyes
                   Pigments



b) Furnishing industry - 33% of total printing industry

c) Special printing styles - 11% of total printing industry



The coating industry discovered the ease and versatility of rotary screan printing and also found that it could make its own demands. The 1983 Itma was the scene of the presentation of yet another Stork finding: the fully automated colour kitchen, the IPS paste preparation system for the textile printing industry. The latest development in the field of rotary screen printing has been the laser, which was introduced at the 1987 Itma. By means of this laser the engraving of a screen requires an average of 20 min., the conventional methods takes 4 to 6 hor. The laser technique also allows the designer to be more creative. A CAD system can be coupled to the laser engraver, so the designs can be processed digitally.

The printing process can be automated right now; in the future it will be possible to couple the laser, the printing machine and the paste preparation system. In the short term it is to be expected that the rotary screen printing technology outstrips all the existing printing methods from a technical point of view. Right now more than 60% of all printed textile is realized by means of this technique. A Ref. [2] has succinctly identified the merits of the rotary screen printing technique and over the last 10-15 years this has emerged as the single most important method for printing fabrics. High printing speeds are coupled with the potential for automation and computerisation of certain elements of the process. The 1991 Itma was aptly demonstrated the numerous possibilities for the application of computer - aided design and manufacturing techniques within the modern printworks.

2. CAD/CAM TECHNOLOGY IN TEXTILE PRINTING

The 1970 s saw a rapid and massive introduction of computer technology into the textile industry.A whole range of new and efficient equipment appaeared in textile printing, allowing an untraditional approach to the preparation,creation and processing of designs and their subsequent application in the printing media.

The necessity of reacting fast to changes in fashion trends and meeting ever-growing competition made various textile manufacturers apply.CAD/CAM systems in textile printing.

C A D is a technique which is capable of using ever more powerful and versatile computer tools for increasing desing production and the weaving process as a whole.CAD is nothing else than the company s technological experience (manware) coded in a programme (software) to be used on suitable computers (hardware)[3].A first example is Julie by Studio Synthesis [1],which is the first integrated CAD/CAM system to be produced in Italy with the aim of introducing automation into an area of production where things are still chiefly done manually:namely,textile printing.

By the beginning of the 1980 s larger manufacturers were using CAD systems for simple manipulation,grading and marker making.Pattern construction was still a predominantly manual operation,with blocks being scanned or digitised into the system[4].In the beginning,connection or interfacing was governed by hardware format,data format and the physical distance between two pieces of equipment.Direct,on-line coupling could be hindered,for example ,because the signal from the CAD system was too weak to reach the CAM equipment without interference or loss of data and the programmes ran on nonstandard hardware.Later advances in communications and networking solved this problem by linking the so-called "islands of automation" and CAD/CAM systems came into existence.By this time (around 1988) the concept of Computer Integrated Manufacturing (CIM) was very much at the fore in the minds of manufactures and system producers wanting to sell their equipment on the basis of its ability to integrate.However,CIM does not just mean CAD plus CAM as we explain later.

There are two alternatives in the way that system communication can be approached ;

1- closed system, ie the meaning of the data is not disclosed as this ties a customer to the systems of one particular manufacturer;and

2- open system,ie all manufacturers have the same set of control information,so that the CAD system of one will drive the CAM system of anther,without conversion.

A CAD system for for textile printing,as example should enable the creation of the studio's own designs,and the processing of other artwork such as designs on paper,colour hard copy or artwork on fabric.

Input modules:

Scanning: This should include the possibility of scanning both colour and black and white artwork in different sizes.It is also important that the scanner has a high resolution capability of up to 300 dpi (dots per irch).

Drawing: The software should enable the user to create the whole design on the screen.The drawing should be carried out with the help of a stylus; using a mouse is less convenient for a designer.The drawing software must comprise a great variety of options:lines of different thickness,vertical and horizontal lines,easy creation of geometric structure ..... etc.

Service modules

Correction

For correction a scanned design,a function for enlarging and scaling down both vertically and horizontally is needed.This enables designs smaller than the original artwork to be processed e.g.to make a colour hard copy reduce in size and enlarge it subsequently to the original artwork's size.

Colour reduction

In some cases the number of colours in the artwork exceeds the colour capacity of the printing machines,making it necessary to reduce the number of colours.The equipment should enable both automatic and manual reduction.

Colour separation

It is necessary to create a multitude of variations from a finished design and to interchange and combine various colours.This requires the system to be able to produce individual colour separations and to provide storge for their easy re-use.

Colour palette

For successful colour manipulation the user should have easy access to the existing colour palette,but also a facility for creating a colour palette individually.The creation of colour shades must be as simple as possible.

Separations set

From the individual colour separations or their combinations the system should be able to produce a separation recording that could subsequently be used in production machines [laser engraver,film plotter,printer,etc.].

Output modules

Should also allow the user to print only parts of a given design for checking purposes.Further,the user should be free to choose between a thermo-transfer and an ink-jet type of printer with the highest possible resolution regardless of format.

Production machine

The output for production machines should correspond with the form used in the production equipment,i.e. the same data format and the same input.

Many contemporary CAD systems enable the creation of high quality design within a very short time, but they lacle linkage to CAM systems. Thus the feasibility of their link-up, on-line or off-line, with systems surrently used in the textile industry such as laser engravers, as well as with equipment for the production of jacquard cards, must be a major consideration for any producer of textiles.

The market for printed textiles, both in the fashion and the interior decoration branch, has been growing strongly in past years. (Fig. 1. [5]). CAD/CAM systems may be used in the field of textile printing in screen production; colour recipe formulation and automation of the control of printing parameters including automatic registration, to name just a few. (Fig. 2).

2.1. Screen Production

Traditional screen production procedures (Fig. 2) involve repeat sketching, colour separation, film-making and photo engraving. The engraving process itself is multi-staged, including degreasing, coating with photosensitive emuision, exposing with positive films, developing, heat-curing and painting out. In case of rotary screens, this is followed by end-ring glueing.

Production of printing screen perhaps is one area where integrated CAD/CAM technology can be full utilised to replace traditional operations and techniques. Scanner input (data transfer); Creating the repeat drawing; Layout; Colour separation; and Out export are the main steps to use CAD technique in suggested typical modular integrated system, i.e.:-

Step no. 1 is Scanner imput, where the following originals can be used a) linework material;
b) black and white material:
c) continuous tone material; and then the originals are ready by a scanner, while Data transfer means that the foreing data is converted in the background and is then transferred to the image processor.

Step no. 2 Creating the repeat drawing i.e., first of all, the repeat drawing has to be made, then an interactive retouching program simulates the repeat so that bad repeat joints between the repeated patterns can be retouched. The interactive function are brush, mask, filter, etc.

Step no. 3 Layout i.e. with the layout, function, complex originals can be collected in large repeat drawing. Furthermore, repeats can be calculated and executed based on the parameterization of the repeat simulation.

Step no. 4 Color separation: The colour information must be assigned to an exact number of separations. Depending on the original, solid and/or continues tone separations will be made. If necessary, individual continues tone separations may be retouched in black and white.

Step no. 5 Output-Export: The export function is responsible for the output. It activates the peripheral units, calculations the colour overlaps and carries out the repeats. All export calculation are made in the background.

Colour Recipe Formulation

Date Base Preparation

	9362	VERSANYL MODRY A 0.5 G/KG
	9363	VERSANYL MODRY A 1 G/KG
	9364	VERSANYL MODRY A 2 G/KG
	9365	VERSANYL MODRY A 5 G/KG
	9366	VERSANYL MODRY A 10 G/KG
	9367	VERSANYL MODRY A 20 G/KG
	9368	VERSANYL MODRY A 40 G/KG

Fig. 3.

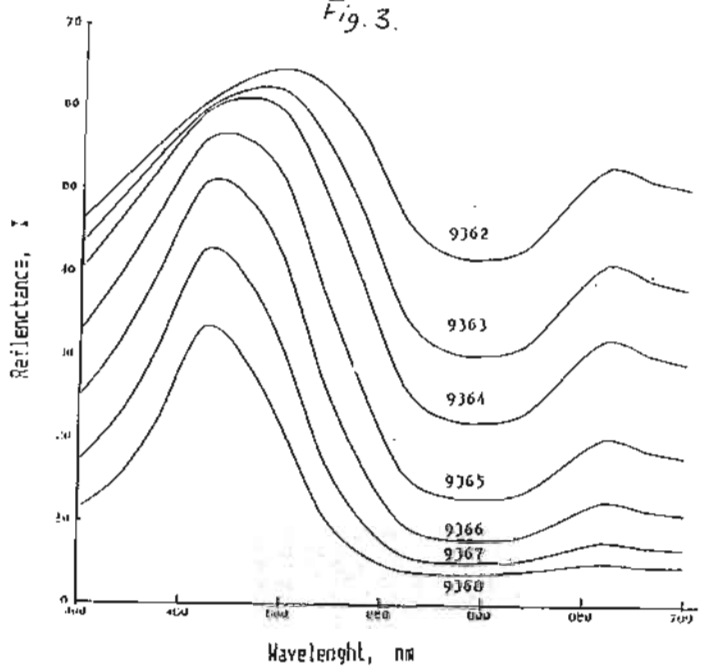
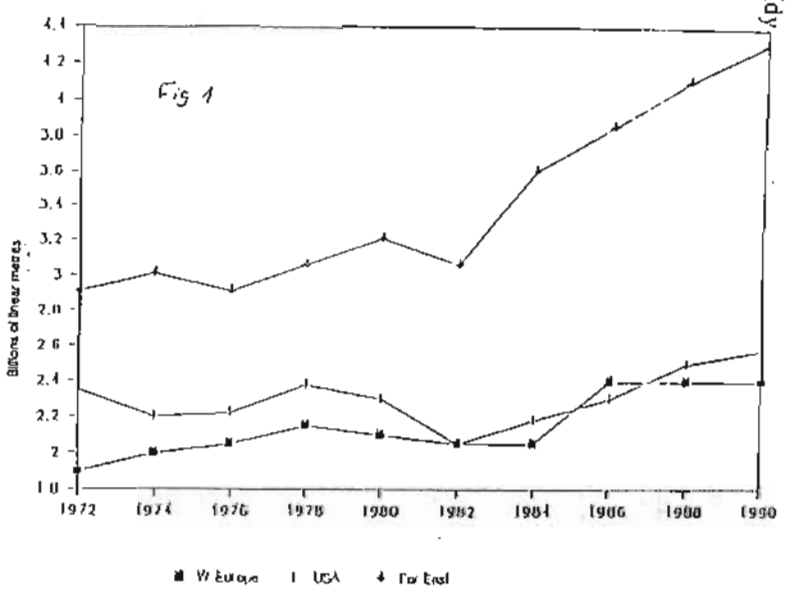


Fig 1



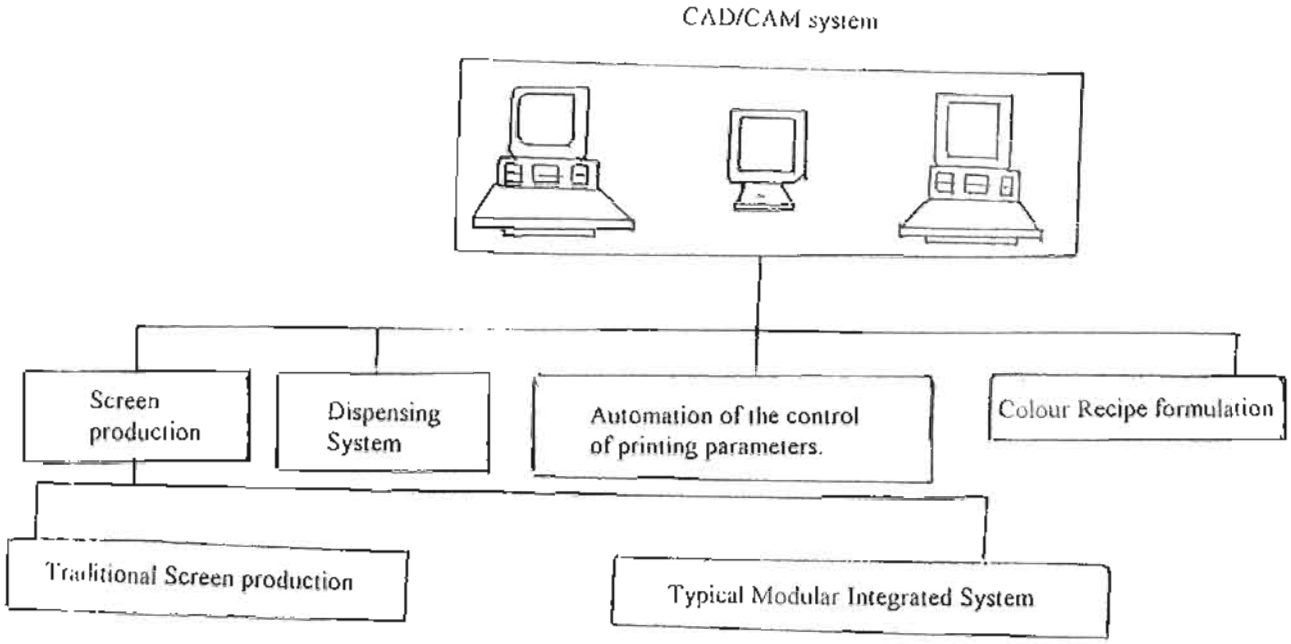


Fig. 2 Show the scope for the application of CAD/CAM techniques in the modern printworks

2.2. Colour Recipe Formulation:

Computer colour prediction is an analytical problem and is based on a definable relationship between a measureable physical parameter of the substrate, namely reflectance, and the colorant concentration.In this work we evaluated a CAD system for pigment paste formulation.We prepared data bases for pigments from different manufacturers.The aim of the study was examination of data basee and possibility of replacement of pigments.The reflectance values of various strengths of the printings were plotted against the wavelength.(Fig.3).

2.3. Implementation of CAD/CAM systems In Textile Printworks:

Egypt Republic

The first use of CAD systems in the EAR for the carpt fashion trends was in the field of textile design , MAC , Oriented weavers , other .It was less than 10 years go when 8 of companies - Esmaalia,BTM,Getan,El-Mehla,El-Nile,Llet; Lly mód: El-Hlbawy,and others-invested in their CDI system,spending over 2000,000 EL on hardware and software that would enable them to create new designs,usually by scanning existing ones into the computer,modifying them as appropriate and printing the result on paper in the required colour combinations.Newadays,the use of CAD/CAM is fairly widespread among the larger companies but is only just starting to be exploited effectively by the smaller ones.The technology is already used for the design of textiles and garments,while computer generated coloured prints are widly integrated in presentation boards used to sell ideas to the retail buyers .

Czech Republic

In Czech republic about 3 000 new designs are processed every year.In the largest Czech printed fabric manufacturer TIBA for more thar 10 years system Response manufactured by Sei-Tex has been used for the processing of patterns of printed goods.TIBA general collection comprises approximately 3500 designs in six to seven colour variations,and approximately 1750 designs are replaced by new ones every year.Tiba ranks among the biggest manufacturers in Czech republic who have printing on fabrics as their main activity.

There are approximately 40 suppliers of CAD systems for textile industry world wide.In Czech republic you can find systems from Datacolor,ies-Texicon and Microdynamics.These systems and used mainly for textile design,screen production and colour vecipe formulation.

2.4. Evaluation of CAD/CAM technology in textile printing

Problems associated with CAD/CAM technology

- The major problems regarding the usefulness of the CAD/CAM technology do not appear to be associated with the computer system but whit the variables likely to be found in the printing operation itself.

These problems are:

- repeatability and levelness of laboratory printing
- variation in procedure used for the preparation of date base (calibration printings)
- variability of the textile substate
- none can simulate the feel and drape of an actual fabric,or the effect of skrinkage in finishing,or the diffeerences in count and density within a fabric
- the resolution that one sees on the screen will be difficult to achieve in actual printing due to mesh size limitation

By using the CAD/CAM techniques in textile printing the following benefits can be observed:

- Quick response; -High flexibility; -High productivity;
- Short delivery times; and high quality printing.

2.5. Conclusion

The aplication of computer technology is very exciting and is now affordable by almost everyone, consequently it has a leveling effect,enabling the smaller businesses to compete with the larger ones on the basis of talent and originality.The professionalism and dynamism of these businesses are factors that are enhanced by CAD technology and some of the newer features that are available in today s systems will futher improve their capability and competitiveness.

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