

Screen printing as a 20th Century graphic medium
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(Intro Image 1)

Within the canon of twenty-first century printing history, screen printing is definitely the poor relation. By comparison a great deal of literature concerning the demise and continued existence of metal type and letterpress has been published and discussed. Yet screen printing as a commercial graphic printing medium has quietly come and gone within the confines of the twentieth century, with very little documentation of either the technical aspects of the process, or its socio-historic context. It is possible to start talking here about screen printing being alive and healthy in an art context as a printmaking medium. In fact that is where the majority of the documentation lies.

(Image 2 Patrick Cauldfield)

Yet that movement bears only a similar relation to the graphic heyday of screen printing in the 1960's and 1970's as say dust grain photogravure does to commercial gravure, where even during that period, the documentation is primarily of the artists such as Warhol in the USA or the work of Chris Prater and the Kelpra studio in the UK, with little or no documentation of its industrial context, or the mechanics of the actual process. To quote from Pat Gilmour in her catalogue essay to the 1970's exhibition of printmaking at the V&A. 'The Mechanised Image: An Historical Perspective on 20th Century Prints'. 'Despite the fact that it is the only graphic medium to emerge this century, it is as difficult to piece together the early history of screen printing as to reconstruct 15th Century relief printing from the incunabula of the woodcut.'

Here, we need some context of how and why screen printing is a twentieth century phenomena and what were the circumstances that heralded its demise. First to its conception, if we ignore all of the arguments about Japanese hair stencils and the textile industry in Lyon, all of which are processes that deserve a history in their own right but are not screen printing. Guido Lengweiler's 'History of Screen Printing' is the only comprehensive historic survey of the medium and firmly places the beginning of screen printing to the USA between 1906 and 1909, with the printing of pennants and flags.

(Image 3 pennants)

However to illustrate the confusion that exists over that history, the first patent that bears close relation to the actual screen printing process was filed by an

Englishman in the USA Charles Nelson Jones who filed his patent in 1887. Whilst Jones has all the elements of the process.

(Image 4 Charles Nelson Jones)

Lengweiler is correct that the process did not start in an extant form until the early 1900's. Along with Elinor Noteboon from Iowa, who apart from Richard Field is the only chronicler of the early history of the process, Lengweiler traces the banners beginnings to the developments in the field of stencil duplication and the work of Gestatner and A.B Dick. These processes again deserve their own separate histories.

Lengweiler then follows his thread through screen prints early conception within the sign and banner industries, as almost a home grown craft, to the first extensive extant documentation of screen prints history, which is with the Workers Progress Administration (WPA) posters, part of a mass job creation programme during the Depression in the USA from 1926 to 1933.

(Image 5 WPA)

We will come back to this, however at this point we need to briefly mention the Selectacine patents from 1916, these created the truly recognisable process as we now know it. With separate stencils for each colour, screens tightly stretched on wooden frames, the stencils integrally adhered to the mesh and a squeegee with a rubber or composite blade. Though in discussion with Michael Twyman last night he was asking me what was the earliest example I had ever seen, which I had collected outside a museum collection. I have to admit I have never seen anything in ephemera or display poster before 1936 outside of a collection. Therefore it is hard to gauge how ubiquitous the commercial process actually was.

Please note that the commentary and documentation of this period, is primarily social and visual appraisal with the only brief technical process commentary, mainly in publications such as '*sign of the times*' an American trade publication for the sign industry. In fact Lengweilers one and only comprehensive history of screen printing comes almost to a complete stop after this point, (late 1930's) with only a minimal reference to the industrialisation of the process and its take up by the point of sale, display, and graphics industries

(Image 6 WPA print 1937)

If you bear in mind this image demonstrates the high point of screen printing for the era, it is now time to look at the technical developments of the process in relation to those parts of the process that have received socio-historic commentary. And in particular the commentary about the artists that used the process. The easiest examples to define this period are the WPA prints from the 1930's these are very well documented as they were by artists employed by the government to create jobs during the depression and many examples exist.

Technically the process changed very little, from that documented by Lengweiler until the introduction of technological changes that are particular to screen printing in the 1960's. Here I am going to concentrate on the UK and Europe as these became the technological home and centre of new developments in the process.

From the 1920's to the 1950/60's, technical developments were small and incremental. Whilst there is some technical documentation through the period from the 1920's, and of the Selectacine process, which heralded screen printings move to a commercial process, through to the end of the 1950's assisted by such printing manuals as Ziegrossen in the late 1930's.

However we do need to put some context to the technical aspects of screen printing at this early period.

(Image 7 Silk Screen mesh)

Starting with the screen mesh and the screen frames, until the late 1950's, silk organza was used, which shrank when wet and being a natural fibre had a consistent thread count, but a variable diameter, each thread being made of multiple twisted fibres which held ink and encouraged staining of the mesh. This fact combined with wooden screen frames, which tended to warp when wet, made accurate registration a problem.

The silk was specifically manufactured for the flour industry, as they used a specific mesh count for sifting flour. The problem with silk is that as a natural fibre it has what might be a hairy surface when viewed under the microscope so attract ink staining and it also expands when wet. Both factors do not contribute to accuracy. Graham Duncombe who used to be CEO of Svecia UK, Svecia were the largest manufacturer of automatic screen printing equipment, described the problems of screen printing commercially to me in the 1990's as being a large saggy net to which you try and attach an accurate image and then print it.

(Image 8 Profilm and Ault and Wiborg image 1929)

For this period of the 20's to the 50's ink for screen printing bore very close relation to gloss paints used for external signage and general use. They were thick films based upon linseed oil mediums, had very slow drying times and tended to be washed up and cleaned with white spirit or turpentine, the traditional solvent for the sign painting industry. In fact in many cases they were almost interchangeable with sign writing products and were called paint, as often as ink. Later in this period saw the introduction of cellulose lacquer based inks that dried in the screen very quickly and were difficult to handle.

(Image 9 Profilm being ironed to the screen)

In tandem the stencils were of two types a hand cut duplex type, which had a paper backing and a shellac based film layer, which was cut by hand with a knife, taking care not to cut through the backing layer. Commonly called Profilm, this shellac based stencil was adhered to the screen by first laying the stencil under the mesh then attaching it with a damp chamois dipped in a mixture of equal parts of methylated spirits. Finally the stencil was then ironed into the mesh once the mixture had softened the shellac. Whilst more accurate than what came before if the paper backing was cut through the stencil would not adhere properly to the screen.

(Image 10 John Minton Tusche stop out)

Previously the screen has been painted directly with a greasy tusche, very similar to a lithographic tusche and then the screen was coated with a screen filler that was water based. The tusche was washed out with white spirit and the screen was printed with oil based colour. This print by the British artist John Minton is a very good example of how you can see the positive brush marks of the tusche in the dark blue colouring and the pink background is a hand cut stencil either in Profilm, Stenplex green the UK version of Profilm or possibly in a paper cut stencil.

(Image 11 Autotype Advert)

If one required a photographic image then the stencil used was bi-chromated gelatine on a paper backing used in the photogravure industry. In all of my history as an academic, my life has been dominated by bichromated gelatine which was essential to every Victorian print process that required a photographic image, whether Collotype, Woodburytype Photo-gravure and in this case screen printing. These photo stencils were known as carbon tissue and required not only great skill to expose and wash out, but also to apply to the screen. For screen printing there appear to be two primary methods. In the UK Autotype's carbon tissue was used, a descendent from Joseph Swanns original

gravure tissue. This appears to have been applied wet, straight after exposure and development, I have yet to clarify whether it was first transferred to an acetate foil support or transferred directly to the screen, either way when the tissue was applied to the screen it was adhered by rolling the softish gelatine into the mesh. In the USA the literature says that it was applied dry, and as yet I have not worked out how this worked.

Image 12 William Turnbull head 1956

So far so good and screen printing had entered the canon of print processes, but I am particularly interested in screen printings boom in the Nineteen Sixties to seventies. This image is a reminder that things had changed little from the 30's to the late 50's. However changes brought about by the popular explosion of photography in the nineteen sixties, heralded a change in the screen print industry. Reprographic line films became readily available along with cheaper copy and process cameras. There was also a fundamental change, from bichromated gelatine to the use of iron salts and gelatine coatings on polyester or acetate film backing, which created a more stable support for the stencil.

(Image 13 Five Star)

The classic example of this was Five Star first produced in 1962 by the Autotype Company based in Ealing. Who as we have said were also were the primary manufacturers of carbon tissue for rotogravure and had a very distinguished history in the production of bichromated gelatine. By the early 70's photopolymeric SBS emulsions such as Dirasol and films like Cappilex were beginning to gain a footing. All of these changes meant an accurate half-tone could be applied to the screen with far less problems of an interference effect or Moire. In parallel thin film inks based upon heavier solvents and EHEC (Ethyl Hydroxy Ethyl Cellulose) started to be introduced in the very early 1960's. These inks allowed a very thin matt film to be printed that dried quickly on paper but was slower to dry in the screen. These inks gave the image a clean crisp look and allowed for transparent layers to be printed without a cloudy, yellowish appearance, which the thicker film mediums created. Vinyl, plastic and epoxy based inks were also introduced at this time.

(Image 14 Screen meshes)

The 1960's also saw the introduction of the first nylon and monofilament polyester meshes produced on shutterless looms with a consistent thread diameter made by such companies as the Swiss firm Saati. These meshes combined with steel or aluminium frames meant that a constant tension could be applied to the mesh and accurate registration became the norm. It also meant with a consistent thread diameter that it was possible to apply a half-tone

stencil to the screen at a consistent angle and there would be no variations in the mesh diameter to cause local moire on the screen. This is not to say it was impossible to apply a half-tone before these changes, but that it was now possible to apply a much finer half-tone consistently with far less problems.

(Image 15 Gillian Ayres)

All of these technical developments together produced a completely different sort of imagery, which has been documented as Pop Art seen here by images by Gillian Ayres and Patrick Cauldfield, but without those technical changes these prints would not have existed.

(Image 16 Patrick Cauldfield)

Social historically it would probably be claimed by art historians, that the prints were entirely dependent on the artists, but I would argue that the artists were entirely dependent on the technical capabilities of the process. There is no doubt that these images are radical departure to what has gone before

(Image 17 CD's)

These major changes that came together not only changed the course of art history, but also pushed screen printing from a back room addition in the hand paint sign shop, to a fully professional industry. Which by 1995 covered three complete halls out of 21, at the once in five yearly global printing trade fair Drupa. All of these were dedicated to the screen printed graphic image. But by 2010 it could not even fill half a hall and most of the stands that were there, dealt with industrial printing or printing on CD's. Currently screen printing has a healthy future as an industrial process which prints your car windscreen heating elements, the element in your kettle or the sensor that measures your blood for diabetes. Screen printing now as a graphic medium has been almost completely superseded by the rise and dominance of wide format inkjet printing. The ability to produce a highly accurate, full colour rendition, at large scale completely by inkjet, destroyed the competitiveness of screen printing. Its advantage had been the ability to render very bright colour and by the early twenty first century had been completely surpassed by the digital revolution.

(Image 18 commercial)

However there is also the social aspect of the history of graphic commercial screen printing to consider, why was it so successful during this short period of 35 years from 1960 to the 1990's. Initially the answer lies in its surprisingly rapid

growth from a simple home made process to commercialism. In the UK this rapid growth meant it was not part of the strict apprenticeship training system and therefore non-unionised. I myself drifted into commercial screen printing in the 1970's and was not a member of any union. However, even I was not allowed to touch any artwork that did not have a SLADE union sticker on it, which meant the work had been approved for production. Further proof that there was a distinct separation between screen printing and the rest of the print industry is exemplified by the printers, go to training text of the 1950's through to the early 70's, Practical Printing and Binding, (edited mainly by staff from the prestigious, at that time, London College of Printing) The book covers every aspect of the print industry apart from screen printing, which does not even merit a mention.

Screen printing was always something of a poor relation, partly due to its versatility. In 1977 when I first worked in the industry I worked for a sign company called Mychett signs and we printed everything from, 10 metre banners, Quarter Plate Steel signs, Window graphics, Billboards, Shop Facia's, vehicle graphics and the tops of Petrol Pumps. None of this really fitted to the conventional print ethic of type on paper, still predominant at this time. However all of these fall into the category of what I would have called graphics and communication via a visual means. Today's idea of what constitutes print is of course very different and much broader.

(Image 19 Handbench

This slide appears to be out of sequence, but I need to mention the difference between the USA and the UK in terms of the machinery for screen printing. As a generalisation in the UK and Europe the vacuum suction table, was a fixture for printing any prints of quality, whereas in the USA, particularly within art printing, a vacuum top was uncommon. However the handbench and vacuum table is the final part of that fundamental change from the 50's to the 60's. Warhol of the right here deliberately wanted mistakes and bad printing in the name of art. In the UK screen printings slick brashness personified swinging London and the vacuum table allowed for big strong flat colour statements.

To return to that heyday, unfortunately, it is not easy to find extant examples of ephemera of a process that was given little technical credence and their relation to the prevailing social context. However there are two areas where samples and literature are identifiable if not readily available. These are in printed rock posters from the 1960's and the artists original print market of the same era.

In regard to original prints, the change in materials available and the very crisp colourful results created a huge rise in the popularity of screen printing for artists. This is exemplified by the pop art prints from both sides of the Atlantic. In

particular Andy Warhol and Chinon in the USA and Chris Praters Kelpra Editions in the UK. It suddenly became very easy to create accurate and detailed photo-imagery, with none of the problems of carbon tissue. The thinner films meant much faster drying times and a crisper image and the new screen meshes meant accurate registration for four colour separation half-tone images.

(Image 20 Richard Hamilton)

This in particular can be seen in the work of Eduardo Paolozzi, Gillian Ayres and Patrick Caulfield printed by Chris Prater at Kelpra Studios. Of course not everybody adopted these new changes at the same time. For many years I had a copy of Richard Hamilton's Kent State Screen Print published by Dorathea Leathart in Stuttgart, which was printed by Dieter Dietz in Lengmoos, Germany, in an edition of 3000. Although printed in many colours, with a half-tone, taken from a television screen. The print had a physical thickness, due to the linseed oil-based ink used which meant that the print could not be rolled and if not handled carefully the print would crack easily. In conversation with Richard many years later it became clear that he deliberately chose this older style of screen printing to give him a thicker print and cloudy ink that more closely represented the rendering of a colour television of the era.

(Image 21 Led Zepplin)

In contrast if we look at a Led Zepplin Poster printed for the Fillmore East in San Francisco in the 1970's. We can see that the photographic half-tone features heavily, along with bright flat colour, another feature of the thin film inks. Although few music lovers would necessarily agree with the sentiment, but there is a real affinity between these 60's rock posters and the punk posters of the 70's and 80's, such as Sex Pistols 'never mind the bollocks' poster by Jamie Reid.

(Image 22 UFO Dantillions Chariot)

A similar freedom can be seen in the posters for the UFO club in England, we can see the use of photo-stencils but also the freedom of using metallic ink and the classic screen print blend. These posters could be produced cheaply in small numbers at relatively low cost, without the constraints of union rules, they certainly weren't constrained to a forme or a square to follow Michaels argument of other printing technologies having less constraints.

(Image 23 Tortie Handbench)

At this point, I will return to the discussion of a further feature that assisted the quality of screen print and this is the Hand bench vacuum table and the semi automatic print bed with a one arm squeegee. This is partly because vacuum tables have been available since the 30's and partly because their adoption was very spasmodic, particularly in the USA. However in the UK and Europe the vacuum table was an integral part of any quality print shop. In fact, this is demonstrated by the competitive market in the UK, with a range of manufacturers such as Marler, Kippax, Graphic and Display, Trumax and Natgraph. Whereas in the USA the only handbench manufacturer Cincinnati has made the same press since the 1950's.

(Image 24 Parralel lift)

My apologies for jumping around somewhat, but the problem of getting across a much maligned and under-researched print process means I want to try and get everything into my allotted time.

In conclusion, it is clear that a number of technological changes radically altered the course of graphic screen printing in the 1960's which were constantly improved over a 30 year period, until the end of the 1990's when screen printing began to be superceded by wide format inkjet printing. My question would be how would screen printing have developed if wide format inkjet printing had not appeared on the scene.