

Harrison & Sons Involvement with Stamp Papers: Part 2

By Glenn H Morgan FRPSL

In his concluding article on Harrison & Sons contribution to stamp paper, Glenn H Morgan writes about the HS and DS range of papers and coating types, the use of watermarks, luminescence and gumming, and Harrison's impact on the postage stamps of America.

Prior to the introduction of the Machin head series of British definitive stamps in 1967 (printed for the first time on a coated paper stock), the stamp paper used had been watermarked and, for definitives, uncoated, but in 1966 trials were undertaken with various types of paper, including an unwatermarked and coated version produced by Harrison (hitherto not used) and known as its 'ST400' paper. The coating resulted in a thicker stamp, meaning that a watermark would not have been visible, especially with the several dark Machin ink colours proposed, and watermarks on British stamps became a thing of the past.

HS papers

In August 1970, Harrison started using the prefix HS, standing for Harrison & Sons, for a new range of water-activated gummed papers (also known as WAG, or lick 'n' stick) that ran from HS1 to HS8, each of which had a specific stamp printing application that continued in use into the De La Rue era. The base paper in this latter period, as supplied by Drewsen, used a paper furnish of 100 per cent chemical wood pulp, somewhat perversely known as wood-free. Wood-free paper is made exclusively from chemical pulp rather than mechanical pulp. Chemical pulp is normally made from pulpwood, but is not considered wood as most of the lignin is removed and separated from the cellulose fibres during processing, whereas mechanical pulp retains most of its wood components and can therefore still be described as wood. Wood-free paper is not as prone to yellowing as paper with mechanical pulp.

Note: The paper weights after gumming shown below are dependent on the type of gum used.

HS1. Used for Royal Mail stamps. Used in both coated and phosphor-coated versions HSS1 and HS1 B3, a starch latex-based coating. The optical brightening agents used for this paper (added to make the paper appear whiter in normal light and brighter under UV) proved to be unstable, in that they faded quickly on exposure to natural daylight. It was replaced by HS2 due to the latter's better gravure/intaglio print quality.

HS2. Used for Royal Mail stamps. Gravure/intaglio coated and tropical gummed stamp paper suitable for printing postage stamps by these methods. This paper could also be printed by gravure and gravure/intaglio combined. Both paper and coating were optically dull to resist discolouration of printing inks during archival storage. Substrate: base paper: 72gsm, after coating:

88gsm, after gumming: 100gsm. Gumming: A uniformly applied film of PVA. Around 1200 tonnes a year was produced of this paper type. Casein, the main protein present in milk, was used in the coating. HS2 and HS6 were the two most commonly used Harrison papers.

HS3. Not used for Royal Mail stamps. This paper was primarily supplied to Enschedé [NL] and was very similar to HS2.

HS4. Used for Royal Mail stamps. Offset litho coated and gummed stamp paper suitable for printing postage stamps by offset and offset intaglio combination in up to 400 line screen offset. Optically dull coating and base paper. Substrate: base paper: 72gsm, after coating: 86gsm, after gumming: 100gsm. Gumming: Particle (dry) adhesive. This stamp paper coating could contain luminescent tagging for automatic postal sorting.

HS5. Used for Royal Mail's reprinted Wilding stamps (this was the only instance when Harrison tinted a paper to simulate earlier paper types that had been creamish in appearance and not the bright white that we are familiar with today), but mainly on Austrian stamps printed at OeSD, the Austrian State Printing House. A gravure/intaglio coated and gummed stamp paper suitable for printing postage stamps by gravure and gravure intaglio combination. Both paper and coating contained no optical brightening agents. Substrate: base paper: 72gsm, after coating: 86gsm, after gumming: 100gsm. Gumming: A uniformly applied film of PVA. This stamp paper coating could contain luminescent tagging for automatic postal sorting.

HS6. Used for Royal Mail stamps. Offset/offset intaglio coated and tropical gummed stamp paper suitable for printing postage stamps by these methods. This paper could also be printed by gravure and gravure/intaglio methods. Both paper and coating was optically dull to resist discolouration of printing inks during archival storage. Extremely white, highly reflective and an excellent vehicle for phosphor/luminescent tagging. Substrate: base paper: 72gsm, after coating: 88gsm, after gumming: 100gsm. Gumming: A uniformly applied film of PVA. This paper had been intended as a multi-purpose type for all printing techniques, but it gave a poor gravure print quality and was superseded by HS8.

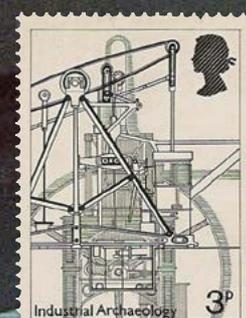
HS7. Not used for Royal Mail stamps, except for the Rowland Hill / Marconi stamp issue. Plain or watermarked, coated and gummed stamp paper suitable for printing postage stamps by offset/offset intaglio methods.



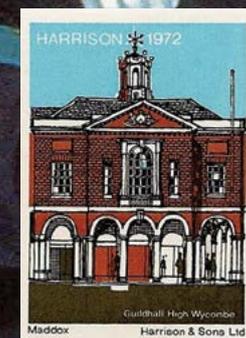
Litho printed



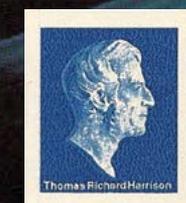
Intaglio printed



Intaglio/gravure printed



Deep-etch printed (similar to intaglio)



Gravure printed

A selection of Harrison dummy (testing) stamps printed after the introduction of its HS and DS range of papers recorded here

Both paper and coating was optically dull. Produced with a high phosphor and paper properties between HS6 ACP (Advanced Coated Paper) and ACP paper. The paper had a higher absorption property than HS6 which should have improved print definition. Substrate: base paper: 72gsm, after coating: 86gsm, after gumming: 100gsm. Gumming: A uniformly applied film of PVA. The stamp paper coating could contain phosphorescent and fluorescent materials for automatic postal sorting.

HS8. Used for Royal Mail stamps. Offset/offset intaglio coated and tropical gummed stamp paper suitable for printing postage stamps by these methods. This paper could also be printed by gravure and gravure/intaglio methods. Both paper and coating was optically dull to resist discolouration of printing inks during archival storage. Substrate: base paper: 72gsm, after coating: 88gsm, after gumming: 100gsm. Gumming: A uniformly applied film of PVA.

De La Rue stamps

Self-adhesive papers, also known as Peel 'n' Stick, or Pressure Sensitive Adhesive (PSA), were also used by Harrison and the prefix DS, standing for De La Rue Stamps, was used for the ex-Harrison specifications during the brief De La Rue (DLR) High Wycombe era. **DS3.** Gravure/intaglio coated and gummed stamp paper suitable for printing postage stamps by gravure and gravure/intaglio and offset/offset intaglio combination printing methods in up to 400 line screen. Both the coating and base paper was optically dull to enhance the archival storage. Substrate: base paper: 74gsm, after coating: 92gsm, after gumming: 106gsm. Gumming: A uniformly applied film of PVA. The stamp paper coating could contain phosphorescent and fluorescent materials as required.

I was able to take a glimpse at the HS and DS paper specifications created by Bill Dorricott at Harrison and, in truth, much was too technical for me, sufficient to say that it took three sides of A4 to describe all of the parameters for each paper type. If your knowledge includes an understanding of phrases such as 'wax pick', 'K&N absorption' and 'ash residue', then you would have been right at home reading those specs.

Tullis Russell Coaters

Papers after Harrison Paper for Royal Mail products was all made by Harrison until DLR took them over, when the contract moved to Tullis Russell Coaters (TRC). Initially, the TRC paper was known as RMS (Royal Mail Specification) paper and was mainly for use with the gravure process. Then TR3 (Tullis Russell 3) became the favoured paper specification, based on Harrison formula HS2 and HS3 supplied by Bill, who moved to TRC with the sale of his division to that company.

With made-on-request paper orders taking between eight and 12 weeks to arrive at the printer, an off-the-shelf paper called Chancellor was subsequently introduced, which continued to fulfil Royal Mail specifications and was still supplied by TRC.

Watermarked paper

In general, the age of the watermark as a security feature is long-since over and base papers from the past 50 years or so have seen an almost exclusive use of unwatermarked



A brass watermark bit once used in the production of paper for British King George V stamps



The 'multiple crown' watermark in use on British stamps, 1958-67

papers. That said, a few stragglers have continued, some to this day, and those specified by Harrison clients in its latter days are recorded below.

It must be noted that watermarks were not applied by Harrison, but were a part of the paper-making process, whereby 'watermark bits' were soldered onto the wires or mesh of the dandy roll creating thinner areas during paper-making in the shape of the particular lettering or design.

Crown Agents*	'Block CA' and 'spiral CA'
De La Rue	'De La Rue'
Joh. Enschedé	'50', 'JEZ' and 'wavy line'
Harrison & Sons	'Harrison & Sons'
India Post Office	'Ashoka pillar'
Indonesia Post Office	'Pentagonal'
Morocco	'DS'
Pakistan Post Office	'Star and crescent'
Saudi Arabia Post Office	'Palm and shields'
Security Printers Malaysia	'SPM'

* Note that Harrison coated, gummed and calendered the base paper that was supplied by the Crown Agents.

Luminescent materials

Harrison chemists worked closely with GPO chemists in the development of luminescence for use with automated postal sorting from the 1960s onwards. The term luminescent is used to cover both phosphorescent and fluorescent materials—the paper is tailor-made to suit the specific requirements of excitation and peak emission for different tagging systems in use around the world.

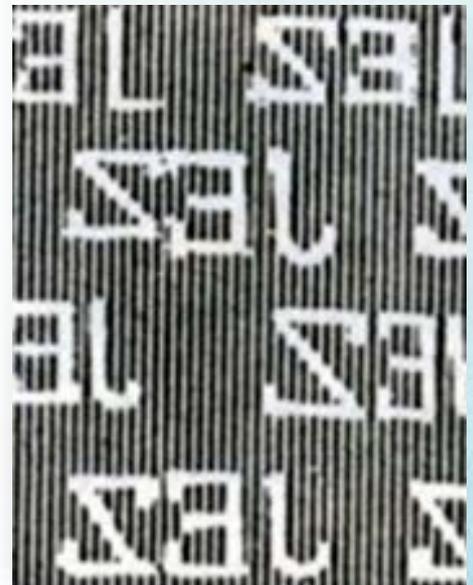
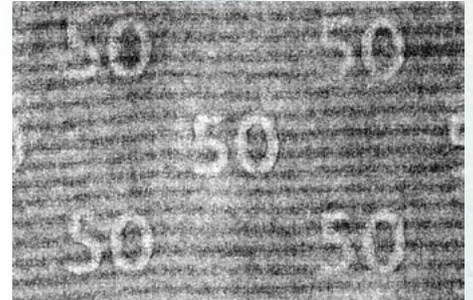
Harrison made the gravure phosphor ink in-house as they were the sole producers of the phosphor powder.



A wire mesh with watermark bit in place and its visual effect on the paper



A selection of the latter-day watermark types

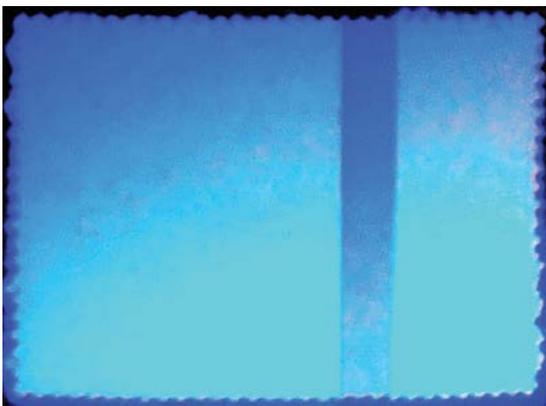


This article cannot begin to go into all aspects of these many coatings, but a few examples of those in use towards the end of the Harrison era are recorded here, together with some of their users, but without further explanation. Incidentally, Bill implemented the introduction of phosphor into the coating (in conjunction with the illustrious Aubrey Walker), from B3 type through to ACP.

Several countries/printers (such as those in/producing stamps for Austria, Belgium, Denmark, Germany, Great Britain, Poland and Sweden, plus Enschedé (early 1990s for GB) used a luminescent additive called 'Cartax DPXT', which is a compound with bright yellow fluorescence under UV light. This enabled the printer to verify that the luminescent was present on the printed stamp during its Quality Assurance (QA) checks.

Type	Country	Emission Colour
Calcium Ortho Silicate Manganese	USA, Taiwan	Red
Harrison / Post Office Organic*	UK, Qatar	Blue/white
Salicylaldoxime Cartax	Canada, Denmark, Germany, Italy	Yellow
Zinc Ortho Silicate Copper	Israel, Japan, USA	Green
Zinc Sulphide Manganese	Australia, New Zealand	Red
Zinc Sulphide Copper	Argentina, Belgium, Brazil, Finland, France, Iran, Malaysia, Mexico, The Netherlands, Norway, Philippines, Qatar, Singapore, South Africa and Switzerland	Yellow/green

* An organic resin. The other types above are inorganic metallic compounds



A Royal Mail phosphor band seen under UV lighting on an unprinted stamp



An unadopted example of 3D bar-coding using luminescence, viewed under UV light

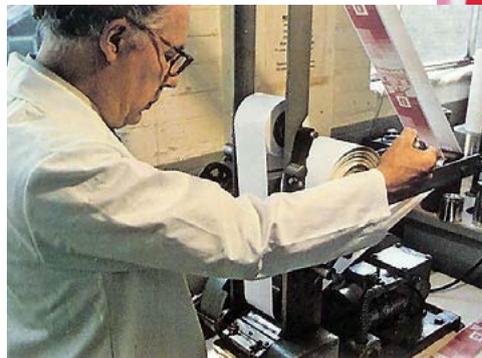
The back of the stamp

There was a move by Harrison away from the traditional and all natural Gum Arabic (GA) to a chemical, synthetic, PVA gumming in the late 1960s due to supply issues with the Sudan, the main source of GA. The gum has good lay-flat qualities and does not require fracturing, so has no 'crazy paving' effect. It is a less glossy gum than GA and supplies are virtually guaranteed, being a derivative of the petroleum industry. Originating in a powder form, Harrison would process to its own formula and apply in liquid form to the stamp paper.

Particle gum (also known as dry gum), with its excellent lay-flat qualities, was introduced by Bill in 1994. It is applied from a solvent in which the gum is not soluble, so discreet particles of the gum (usually a Dextrin derivative) can be applied to the stamp paper to accommodate changes to the moisture without incurring curl. Particle gum is easy to identify as it is totally matt in appearance and often stamps are mistaken for being un gummed. Dextrin was added to the PVA from around 1972/3. This, in addition to the paper weight being increased, was to produce a 'heavier' paper that would perform better with the rotary Kampf and Swedish Lawnmower perforators then in use.

Gum colour

PVA and Dextrin are colourless; a dye was therefore added, as without it stamps could be mistaken as being un gummed. PVA had a slight brownish tint (1970s), while



Laboratory QA testing of paper at High Wycombe, 1975

The QA paper testing sheet seen in the photo alongside, 1975

Approximate dates of gum usage	
Gum Arabic (20-30gsm)	For many decades, then again between 1969-73 following reintroduction for those printings perforated by the Swedish Lawnmower perforating machine.
PVA (12-14gsm)	1967-73.
PVA Dextrin (13-15gsm)	1972/3-1994 and Layflat particle gum (15-17gsm) 1994-97.



PVA/Dextrin possessed a slight bluish-green tint (1973 onwards), although this can be found in a very green shade.

Working with America

It would be easy to assume that the United States was totally capable of meeting any of its domestic needs internally a few decades back, but in 1987 Harrison supplied a type of paper that had been developed by Bill that incorporated the tagging on the paper surface at the time of coating, known as Phosphor Coated Paper (PCP). This type of paper had previously been produced by Harrison for the likes of South Africa and for use by Enschedé.

This PCP paper was used on a 22c 'Flag Over Capitol' stamp uniquely identifiable by having a letter T (for Test) central to its bottom margin. Collectors loved the way the intaglio printing ink was truly raised, for on other US issues of the period the tagging was applied after printing, therefore flattening the all-important raised feel. The PCP paper also made the stamps look sharper and crisper in appearance.

Bill's work in the American paper market continued by developing a stamp paper plant for the US government, introducing stamp paper specifications for the United States Postal Service (USPS) and frequent liaison with the American paper mills.

Incidentally, around the 1990s it even seemed possible that Harrison would become a stamp printer to the USPS, but the idea of getting its stamps printed abroad eventually proved to be a step too far for that time.

...and finally

It is hoped that readers will now have a better understanding of modern stamp papers and in particular the major role that Bill and the much lamented Harrison and Sons played in the development of the papers that are used to this day around our world. When De La Rue took over Harrison in 1997 it had no interest in the stamp papers business and so gradually the contracts passed to other paper suppliers. Fortunately, the British company Tullis Russell Coaters (TRC) was able to take-up much of the slack, including the paper requirements of Royal Mail. DLR sold the Division and Bill's expertise to TRC and subsequent papers were based on Harrison formulae. TRC remains a chief supplier of stamp papers to the world's stamp printers and postal administrations.

In reality, my time spent with Bill and Brian had left my head spinning somewhat due to the highly technical nature of the subject, but this was a story that deserved to be told and it is hoped that this distillation of our discussions will prove to be both useful and informative. My sincere thanks go to both men, not only for the time that they spent with me over lunch, but also for subsequently verifying that the above account is an accurate reflection of procedures.

As a Harrison company paper brochure once stated: "We don't just sell paper - we provide a complete technical and product service." A truer declaration could not have been made.



Adding fresh milk to the Gum Arabic reservoir to prevent frothing of gum, 1950

Gumming the base paper, 1950



A vat of Harrison gum with blue tint added, 1975



PVA gum with brown dye being applied to the reverse of the paper, pre-1973



The 'T' stamp, as printed by the Bureau of Engraving and Printing, 1987

References

Several items of internal (unpublished) and external (published) items of literature produced by Harrison & Sons (High Wycombe) Ltd.

Detailed discussions and email exchanges with Brian Janes and Bill Dorricott, and with philatelic specialists Graham Eyre and Ian de la Rue Browne.

A 2014 lecture by Martyn Fry, Royal Mail's current Stamp Production Manager, to The Friends of the British Postal Museum & Archive.

Notes made by the author during personal visits to Harrison & Sons, De La Rue, Tullis Russell Coaters, plus the Metsä-Serla (Finland) and Frogmore and Sittingbourne (England) paper mills.

The House of Harrison "At Home" by [unspecified]. Published by Harrison & Sons Ltd., 1950.

Harrison: a family imprint 1750-1950 by [unspecified]. Published by Harrison & Sons Ltd., 1950.

A Timeless Classic: the evolution of Machin's icon by Douglas N Muir. Published by The British Postal Museum & Archive, 2007.

Stamp Paper by J K Clarke of Samuel Jones/Wiggins Teape Ltd. *British Philatelic Bulletin* [GB], January 1974.

Stamps for Pleasure 2: Paper and watermarks by James Watson. *British Philatelic Bulletin* [GB], February 1977.

Printed Phosphor and Phosphor-coated Stamp Paper by Aubrey Walker. *British Philatelic Bulletin* [GB], April 1977.

Stamp Paper - a product of today's technology by Adrian Topham B.Sc., M.I. Chem. Eng. *British Philatelic Bulletin* [GB], July 1977.

Just a Piece of Paper by [uncredited]. *Harrison Informe* [GB], Spring 1978.

Stamp Paper by Arthur King. *Stamp Magazine* [GB], May 1988.

Good Stock by Tony Sharman. *Stamp Magazine* [GB], February 1996.

Paper from Happy Valley by [uncredited]. *Stamp Magazine* [GB], August 1996.

Making it Stick by John Winchester. *Stamp Magazine* [GB], December 2012.