Label Packaging

Content

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I. Introduction

I.1. Overview and factors in the selection of labels

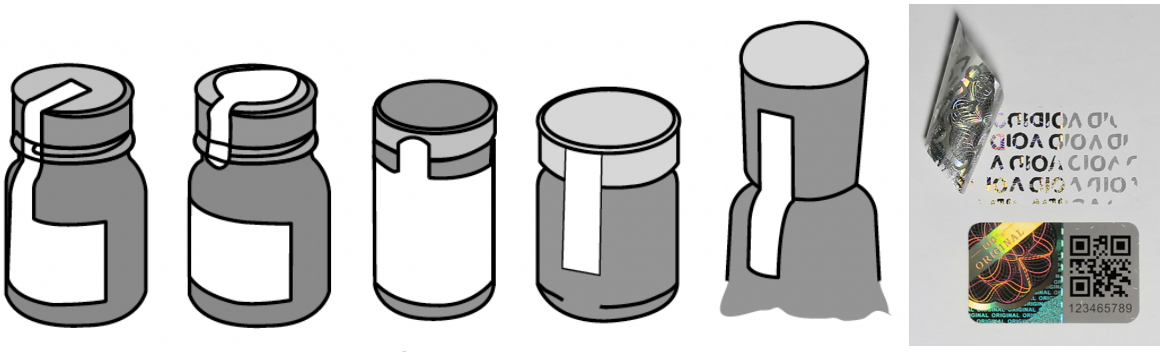
Labels are a means of contact with the customer to promote product images or brands, add information regarding contents or usage and provide the name and address – even claim all kinds of (unproven) health, digestive, beauty or other benefits of the product, etc.

Initially, labels were applied to bottles (glass or plastic) and cans using wet-glue or pre-gummed adhesives, while pressure-sensitive adhesive was developed later for more flexible applications.

More than 70% of labels are directly printed on a substrate such as paper or plastic which provides high-quality printing images, run length and vary quality order, easier to change any changing information or image on the label than direct decoration on containers. In case the brand owner requires a printed image not too high-resolution, less change on product content along with a mass order, direct decoration on containers (ex. Cans) has a competitive cost over printed labels.

When selecting label type, a developer should consider each label technology and its advantages and disadvantages in the provision of label solutions for different applications, which could include:

- Cost of each type of label materials (*non-adhesive or pre-adhesive, metallised, etc.*), printing techniques (*flexographic or offset, inline options, number of colours, sheet or web printed, etc)*, their converting process and visual effect appearance and image expectation. (*aesthetic appeal, tactile, embossed foil or film laminated, etc)*
- Label durability (resistance to scuffing, scratching or image deterioration) and environmental consideration (*recyclability, returnability, removability, waste disposal*)
- Production flexibility (*ease and speed of label line changeover*) and volumes required (short, medium or long runs)
- Capital investment and speed of label line applicator (*Wet-glue or self-adhesive, high-speed labelling required?*)
- Running cost rate of label line (*operator and machine*) and downtime (*set-up, clean-up, removal of misapplied labels*)
- Performance needs of the label (*chemical or water resistance, wet-strength, high or low-temperature usage or application, etc.*)
- Label formats (*reverse-side printed, leaflet or booklet, etc*) and security features (*tamper-evidence, anti-theft, brand protection, hologram*).



Types of tamper-evident security labels.

Overall, the label cost will depend on the cost of the plain material, printing and conversion costs, volume order and distance delivery, these factors are most influential to label selection of user.

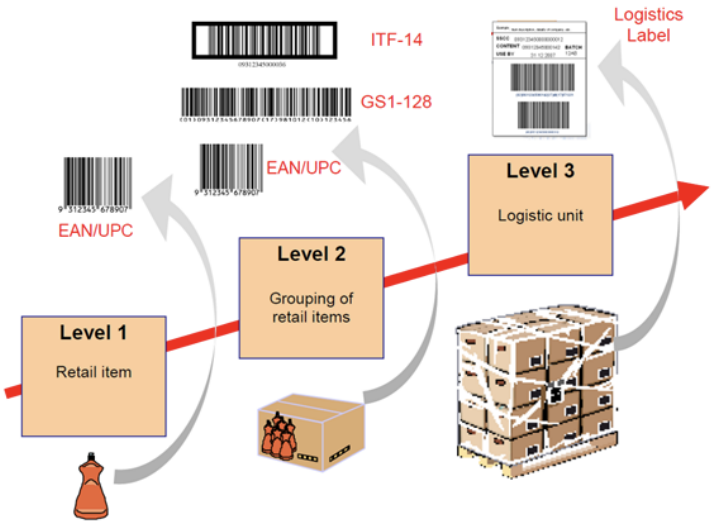
I.2. Nature and function of labels

Many packages and containers normally carry more than one label. Each one has its own specific brand or information purpose, enclosing more functional types such as addressing, tracking and tracing or security purposes.

The key roles and functions of labels are set out:

- ***Primarily labels*** are designed to carry and promote the product's brand name and image identification (logo, unique colour) that will attract and appeal to prospective buyers. Primary labels can cover product information, but in some applications, the information can be read from the back of the container on a reverse side label known as a secondary label.
- ***Secondary labels*** are usually smaller and are used to carry information such as a list of ingredients, health or safety requirements, nutritional details, instructions for use, European Article Numbering (EAN) Code, warnings, manufacturer or supplier name and address or registered office of the manufacturer or packer, prices, volume, weight or quantity and possibly promotional or special offer deals, etc.

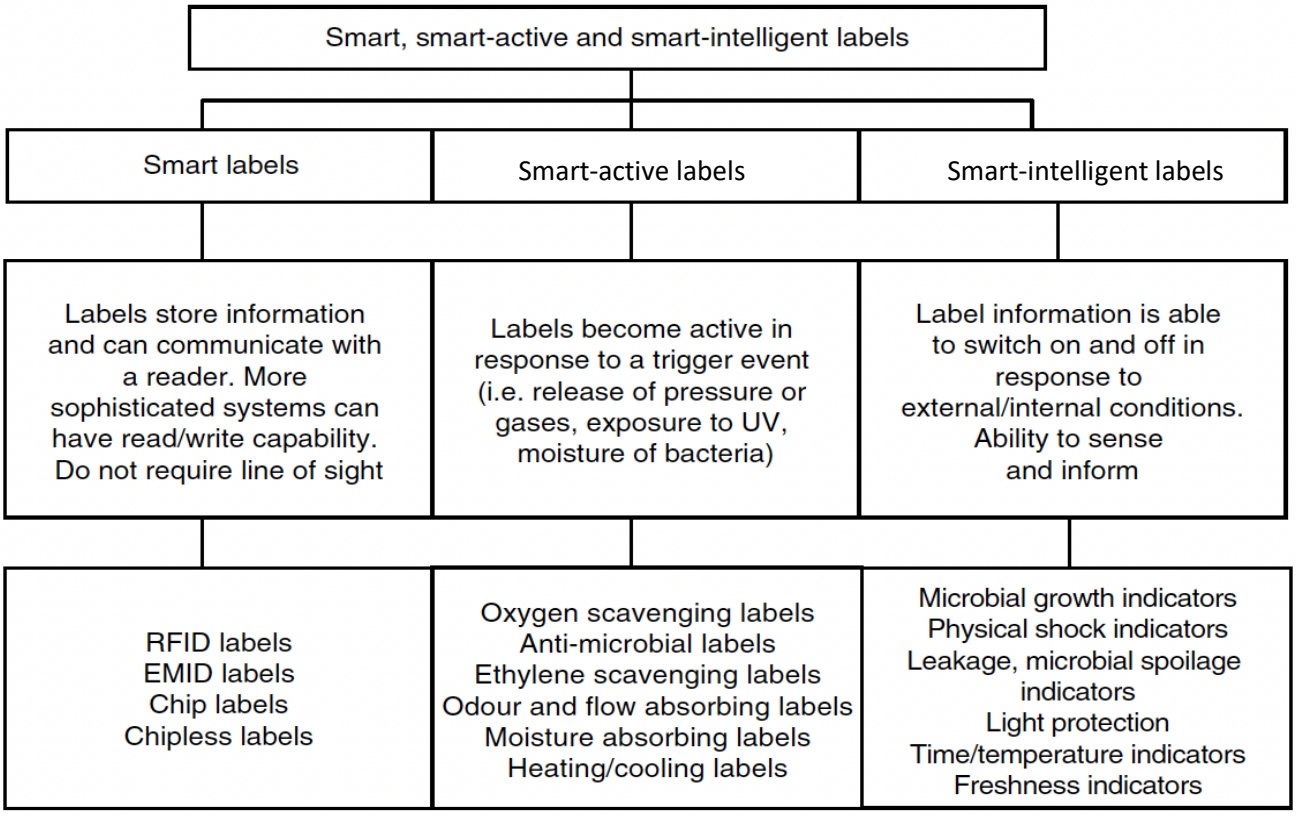
With one-piece wrap-around can and bottle labels, the primary and secondary elements are all incorporated into one label, rather than being two separate labels.



Regulations for placing barcodes on each functional label

A logistics label used on the carton

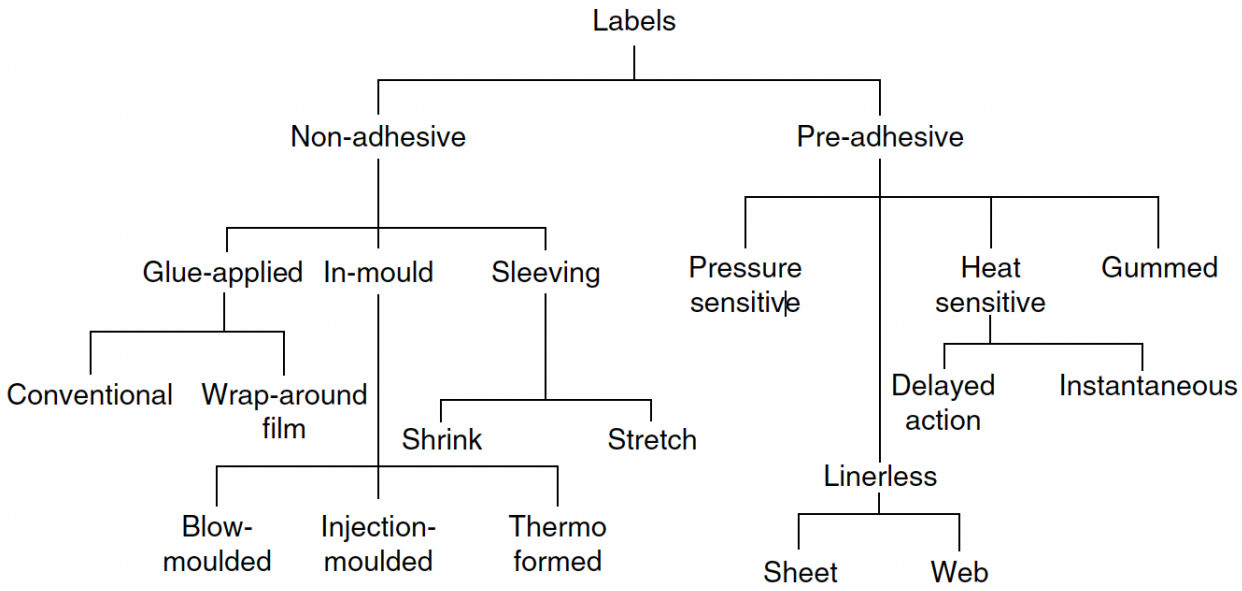
- ***Logistics labels*** are different to 1st and 2nd labels which are found on unit packs such as individual bottles, and cans – there is a need for labels on transit packages (cartons, trays, boxes, cases and pallet loads) that are used to distribute goods and track and trade their movement in the supply chain to ensure they reach the correct delivery address. There are variable text and unique numerical or bar code symbols using thermal, laser or ink-jet unprintable labels. More recently, smart, intelligent or chip labels have been developed, typically these label solutions are based on smart label radio frequency identification (RFID) technology.
- ***Smart, smart-active and smart intelligent labels*** which beyond conventional labels to provide a whole range of clever label solutions, as can be seen in the chart below:
  Their enormous potential is to increase brand and product values, and interaction between product and consumer. QR codes and Snap Tags are some of popular used smart labels that turn brand logos and product information into interactive marketing tools.



I.3. Type of labels

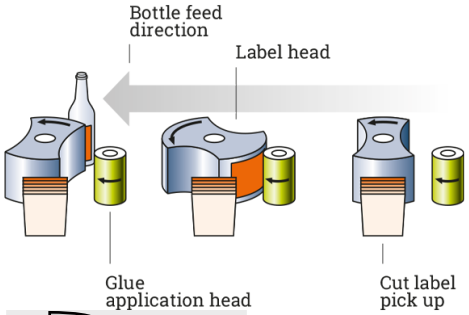
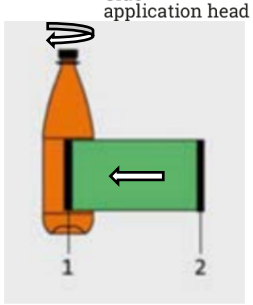
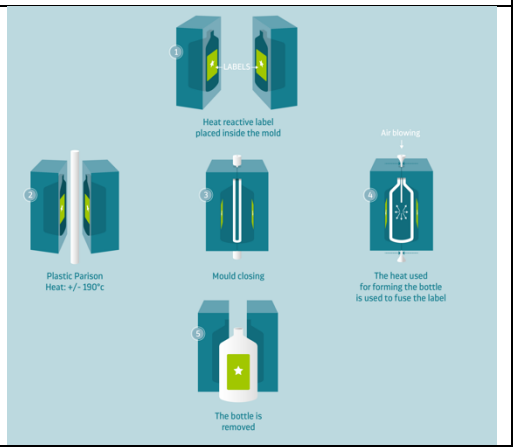
Labels are produced using solid or synthetic substrates (paper, film, metallic foil, metallised paper, etc) and adhesives such as wet glue, gum and self-adhesive based on the acrylic compound. Today, self-adhesive labels make up close to 50% of all label usage in the market, although wet glue is still well above 30%.

There are two groupings of labels based on adhesive application with the range and variety of available label types can be classified as chart below:



Types of labels used in the early 2000s. Source: Labels & Labelling Consultancy.

A – Non-adhesive labels

Label type	Substrate	Description	Application process
Glue-applied	• One-side-coated grades and uncoated white or bleached, kraft paper 55 – 100 gsm. • Metallised paper. • The laminate of paper/aluminium foil, film/paper or multi-layer films. • For wrap-around label, used materials is coated BOPP (19-50 µm) and coated BOPP (30-70 µm), metallised BOPP available.	• **Pros:** the variety of effectiveness and used materials, available coating and printing technologies which create many types of labels. • **Cons:** Material cost is an important factor and also labelling tools for selecting these labels, others is related to substrate performance. • **Labelling**: A wet-glue or hot-melt adhesive is brushed or rolled onto the back of each label just before it is applied to the container. Glue line can be skip, pattern or stripe, depending on adhesion, application speed and drying time of glue. The key uses for glue-applied labels are in the high-speed (up to 60000-80000 unit per hour or more), high-volume, low-changeover labelling of drinks bottles and for canned foods – both human and pet food.	  *Wrap around label featuring hot melt glue strips on leading and trailing edges*
In-mould	• Paper labels coated by a heat-seal back layer. • Plastic film (OPP, PE) which can fuse to containers.	• In-mould label involves placing pre-printed rectangular or square shaped labels within a mould immediately prior to blowing, injection moulding or thermoforming of plastic into it to form a container. • **Pros:** Label becomes an integral part of the finished item without labelling machine on packaging line. • **Cons:** The labelling speed of in-mould labels is not high and depends on the plastic container forming productivity.	

Sleeving	● Pre-stretched PVC, OPP, PET or LDPE, LLDPE with their thickness is the range from 35 to 90 µm.	● **Pros:** Offering a high-quality 360º method of decoration for unit packaging, saving cost and light weight if labelling on glass bottle. ● **Cons:** Somewhat higher cost due to thick filmic materials and application process.	

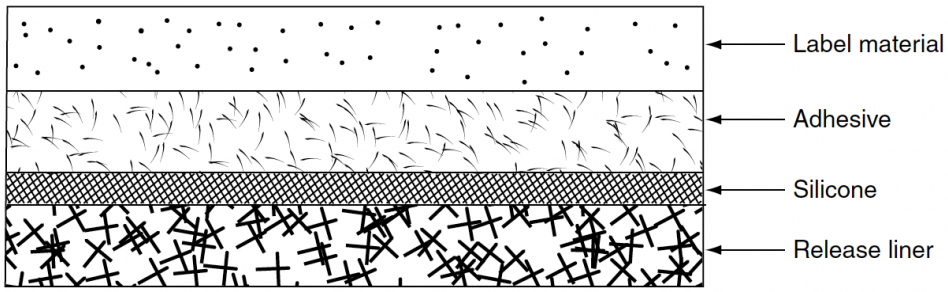
B – Self-adhesive labels

The substrate of these labels is more diverse than for any other method of labelling, using paper and board, film, synthetic papers, foils and laminates, as well as a whole range of surface treatments and top coatings to meet specific applications. The most commonly used label facestocks include:

- Uncoated paper and paperboard; metallised paper, synthetic paper and paperboard.
- On-machine coated, double-coated, high-gloss-coated and cast-coated paper and paperboard.
- Polypropylene (PP), orientated polypropylene (OPP) and bi-axially orientated polypropylene
- (BOPP), acetate, metallised film.
- Polyester (PET or PETE), Polyvinyl chloride (PVC), Polyolefin (PE, MDOPE or HDPE)
- Metallic foil.

Label thicknesses may vary from around 40–50 μm up to 80, 90, 100 or more microns depending on requirement and application. The release-backing paper or liner used for self-adhesive labels may be super-calendered unbleached kraft or glassine, coated with silicone or fluoropolymer. Filmic liners are used for clear-on-clear label films with grammages can be low as 50 gsm or even lower.

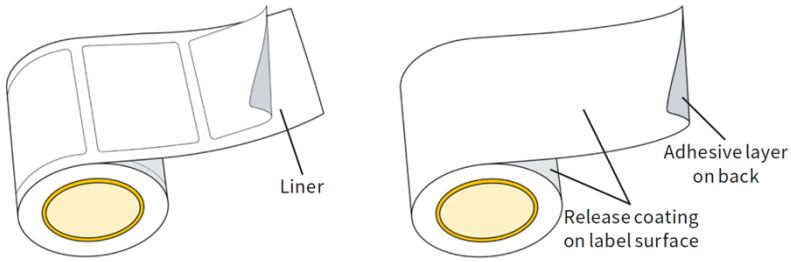
Almost all self-adhesive labels are made up of a sandwich construction including a face material (the label), a sticky pressure-sensitive adhesive and a siliconised backing paper or liner.



Self-adhesive label structure.

Self-adhesive labels are more expensive than wet-glue but they are simple, clean and easy to apply using hand-held, semi-automatic or high-speed applicator systems. The application speed can up to 60,000 unit per hour (multiple head labeller) equalling glue-applied labels.

Label application undertake on machines in which the label is dispensed from the liner and applied to the bottle, container or pack. The direct transfer of labels from a reel permits the exact placement of labels in front, back or neck positions, top or bottom placements if required, into recesses, around corners etc., and can be easily changed in any combination depending on the number of application heads on the machine.



Conventional label **Linerless label**

The other type of self-adhesive label is linerless label which does not use liner and save more material. The printed surface of label will be coated by silicon allowing the web of self-adhesive labels was then wound on itself without the need for a separate release liner, but label still release easily as

conventional label. A key limiting factor to this technology was that the labels had to be die-cut to shape on the label-applicator line.

I.4. Label Adhesive

The adhesive selection used for labels must adapt to any different surface of materials produced many label types and good bonds to the different surfaces of many materials of containers. In some cases, the container is coated with special coatings which can increase surface strength, and minimise breakage (eg. Glass bottle) the adhesive of the label must meet this.

Depend on label types, different user-performance characteristics, labelling technology uses four main types of adhesives: hot-melt, water-based, solvent-based and curable adhesive systems.

<table>
<tr><th>Adhesive type</th><th>Description</th></tr>
<tr><td>Hot-melt</td><td>The nature is thermoplastic materials with 100% solids that are heated to temperatures above their melting point and applied to substrates in the molten state, own a high initial tack and set as quickly as they can cool down to their solidification temperature
Key criteria in the use of hot-melt adhesives are temperature – which controls viscosity and adhesive film thickness, which affects speed of setting, tack and open time</td></tr>
<tr><td>Water-based</td><td>They are made up of materials or compounds that can be dissolved or dispersed in water to become tacky and form a bond, and they dry by losing water through evaporation or by penetration into the label substrate.
Water-based adhesives are available either natural or synthetic polymers as follows:
<table><tr><th>Synthetic polymers</th><th>Natural polymers</th></tr><tr><td>Polyvinyl acetate (PVA)
Acrylics
Polychloroprene
Polyurethane dispersions</td><td>Casein
Dextrine/starch
Natural rubber latex</td></tr></table></td></tr>
<tr><td>Solvent-based</td><td>They are made from synthetic materials and dissvolved in adequate solvent. Solvent-based adhesives have a fast bond strength development, good heat resistance, adhesion to a wide range of substrates and tolerance to a wide variety of production conditions – including low temperatures and high humidity.
Solvent-based adhesives are now less popular usage than hot-melt and water-based adhesives because they need to meet clean air legislation requirements.</td></tr>
<tr><td>Curable</td><td>They are made from 100% solid thermoplastic materials containing curing agents which help form crosslinked intramolecular by using UV or electron-beam systems to ‘cure’ or set the adhesive.</td></tr>
</table>

Certain performance criteria have to be incorporated into adhesives like cold-temperature application, wet-bottle application, food contact, chemical or product resistance, water resistance, heat or cold storage, removability, immersion in water, recyclability and more. Consequently, adhesives are custom-designed to meet all the required label types (wet-glue, self-adhesive, gummed), the required

surfaces to be bonded and the necessary performance characteristics such as Semi-permanent or permanent adhesives, removable adhesives, filmic adhesive grades, freezer-grade adhesives, etc.
As far as wet-glue label adhesives are concerned, there are three main adhesive groups:

- Glass-container label adhesives are water-based casein, non-casein, synthetic or resin-based adhesives which offer high performance, superior water resistance, moisture and ice resistance throughout the label application, bottle line handling and conveying, palletising, shipping and end-use stages. If labels need to be removed after use, then a non-water-resistant adhesive is used. (eg. Casein glue can be easily removed in caustic cleaning solutions.)
- Rigid plastic-container label adhesives are designed to provide good wet tack and adhesion when labelling at high speeds.
- Metal-container label adhesives are hot-melt adhesives developed specially for the labelling of cans and offer hot pickup for roll-through labelling equipment and good hotmelt adhesive performance in rotary labelling equipment.

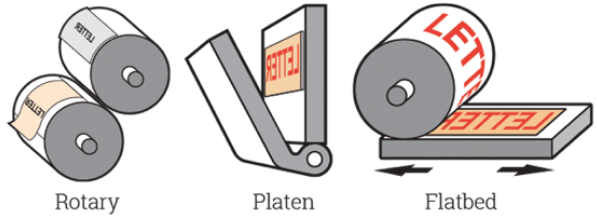
II. Label Production

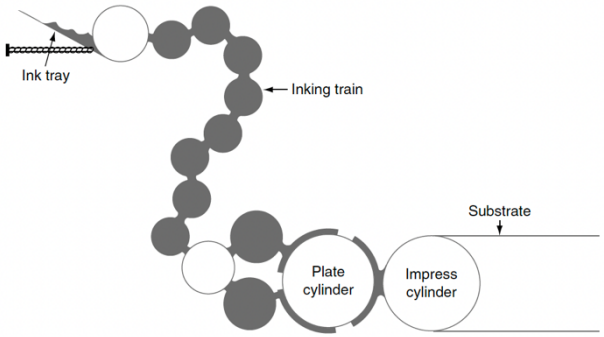
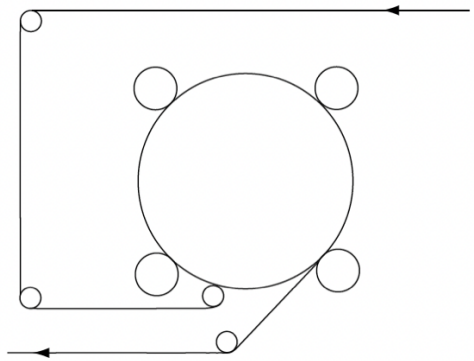
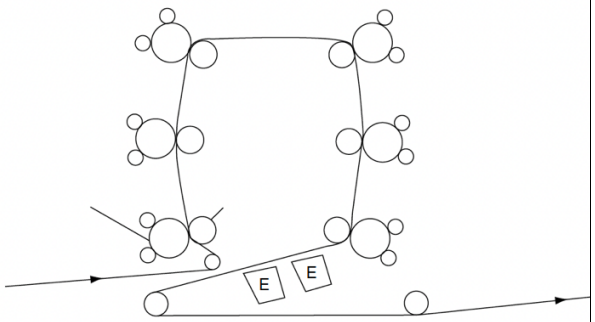
II.1. Label printing and production

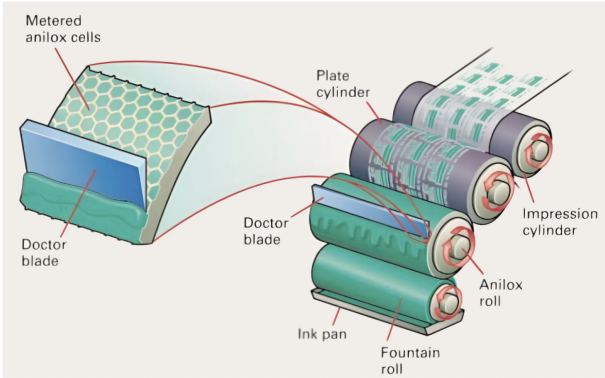
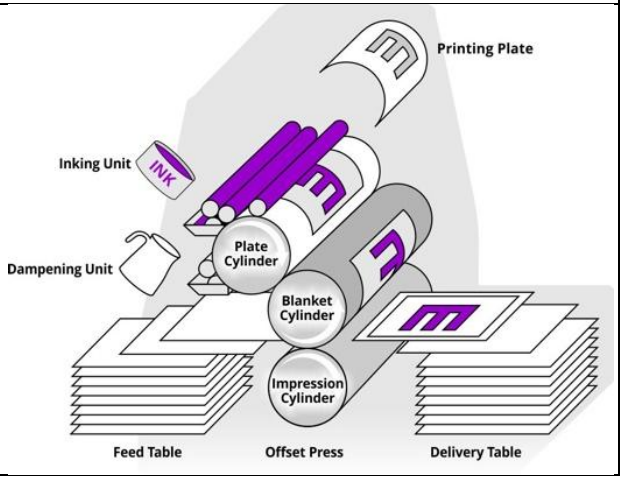
The printing and production of labels are undertaken on a wide variety of process – from sheet-fed to wed-fed – and using almost every available printing process. The type of press or process used is determined by:

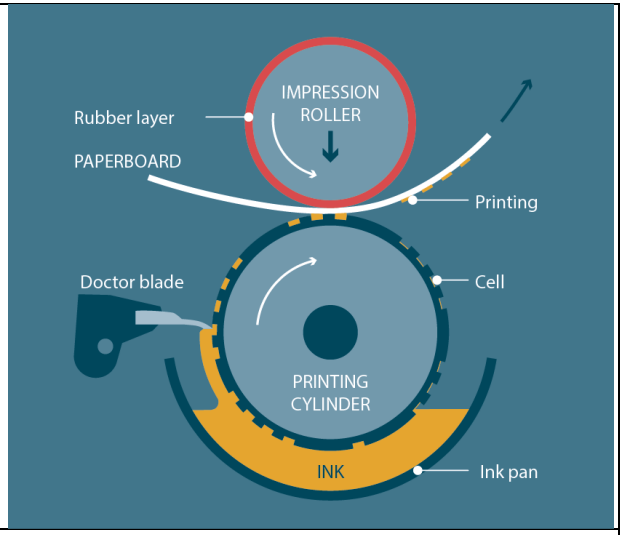
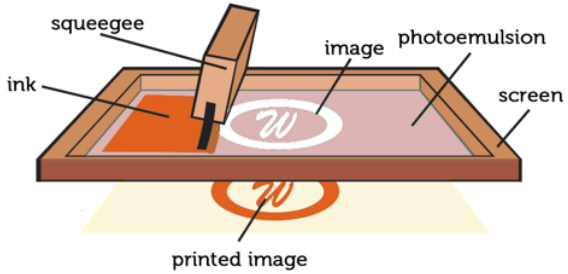
- The specific label or printing requirement
- The demand and quantity of labels
- The nature and quality of the printing, the number of colours required
- Whether subsequent converting operations (die-cutting, embossing, metallic foiling, laminating, waste stripping, etc.) are carried out in-line on the press or are separate standalone operations.
- How the labels are to be shipped to the packaging or bottling line (in slit reels, cut to size or punched to shape in stacks)

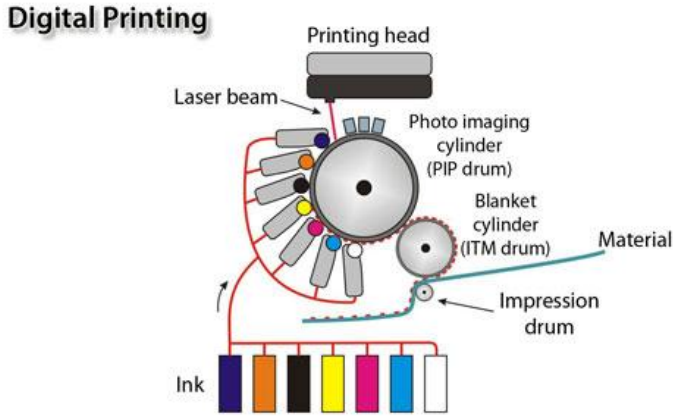
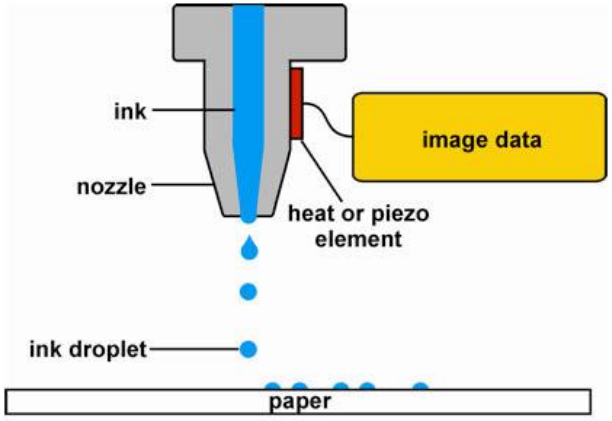
Additionally, apart from the mechanical printing process used to produce pr-printed labels – rotary and semi-rotary letterpress, flexographic and UV-flexo, screen printing, lithographic (offset), gravure, hot or cold foiling. Otherwise, there are a raising demand of non-touch printing or VIP solution used in the label industry, these include thermal printing, laser and ink-jet and, more recently, digital printing. Some specific printing processes were used popularly on labels production shown as below

<table>
<tr><th>Printing process</th><th>Short description</th><th>Illustrated image</th></tr>
<tr><td rowspan="3">Letterpress</td><td colspan="2">The relief printing process uses a metal printing plate or photosensitive polymer plates, onto which an image (the ink-carrying area or relief) is produced using photographic or direct-imaging plate-making techniques.
There are several forms of letterpress printing such as rotary, flat and flatbed printings, in which the printed image can be transferred directly from the relief printing plate to the substrate or indirectly printed through a central impress drum before being applied to the substrate.
Rotary letterpress in-line, common impression drum, or stack roll-label presses are significantly used in letterpress printing; they allow for higher printing speeds while using UV inks, applying in-roll presses with narrow-web (200, 250, 360, 400, or 450 mm) for the production of self-adhesive labels.</td><td rowspan="3"> 


</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>An impression drum label press</td><td>a stack label press</td></tr>
</table>

Flexography	This is a relief printing process in which ink is applied only to the raised surface of the image on the printing plate and then transferred from the printing plate to the surface of the label substrate. There are many flexographic printing processes similar to letterpress printing. Of these, narrow-format printing is the most widely used process for producing self-adhesive labels. Flexographic printing is suitable for medium-order quantities, but the cost of the labels is higher than that of some other methods, such as gravure or offset printing.	
Lithography (Offset)	A high-quality planographic process in which the image (hydrophobic) and non-image (hydrophilic) areas of the printing plates are on the same plane (flat) surface but are differentiated chemically in a way in which the image areas are made to become ink-receptive and hydrophobic. This printing process used widely in producing glue-applied paper labels using a wide variety of sheet-fed presses.	

Gravure	Gravure, or photogravure, is a true photographic process which is able to reproduce high-quality pictures, excellent colour densities and strong solid areas. A printing cylinder of plating copper-niken containing the cells rotates in a thin, fluid, solvent or water-based ink which fills the recesses. Surplus ink is scrapped from the cylinder surface by a flexible doctor blade, the ink in the cells (the image) is then transferred to the label substrate using pressure against a rubber-covered impression cylinder. Gravure printing is suitable for large quantities of orders and long-run production. This printing method is used to produce applied-glue labels or flexible packaging and allows *printing* on any treated material substrates.	
Screen (Silk) Screen	This is the oldest printing method that uses a fine mesh of nylon, PET, or metal treated with a photosensitive coating, where ink is passed through the areas where the photosensitive material has been washed away, and then applied to the substrate via a “squeegee”. This method can control the ink lay-down and provides durable, high-quality labels, especially where good ink coverage is needed for resistance to weather, moisture, chemicals, and abrasion. It is suitable for producing self-adhesive labels and other printed goods.	
Variable information printing (VIP)	This is a modern printing method that uses various techniques, including ion deposition, laser printing, direct thermal, thermal transfer, dot matrix, and ink-jet. It is ideal for information or images that require fast printing without large quantities and press-processes. Examples include barcodes, sequential numbers, batch and date codes, price-weight information, lot numbers, names, mailing addresses, etc., via a stand-alone printing unit.	

Digital	Based on inkjet or ion deposition technology, this method utilizes large-scale industrial printers compared to traditional inkjet printers (VIP). It allows printing on any material and producing sample products, mock-up models, or printed products with small order quantities. The new generations of higher-speed, longer-run digital colour presses are claimed to be cost-effective for up to 30 000–50 000 labels.  *Electronic charging toner printing*	 *Dot ink-jet printing*

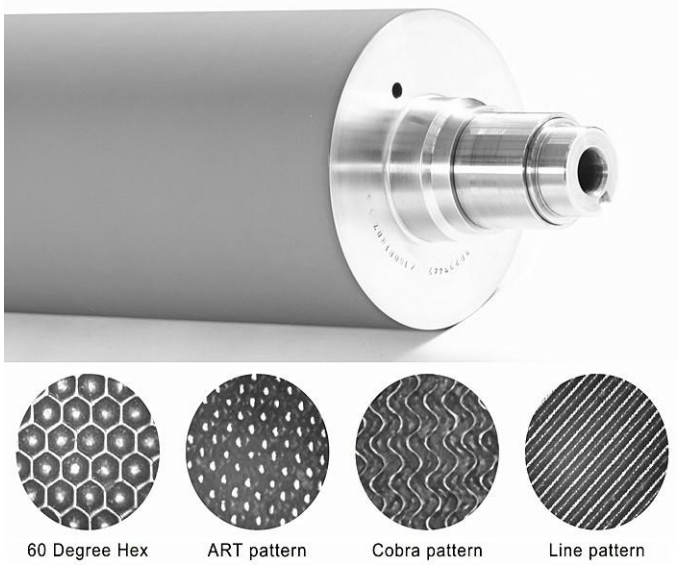
Hot-foil blocking/stamping process is being used more and more as either the sole printing process or as a process incorporate alongside others printing methods mentioned above, in a combination process press in order to add an extra-value capability to the printed label. It is a dry-printing process without using inks, under any format presses for printing production.

Hot-foil tamping label gave an extra brightness and metallic effects.

II.2. Post-print finishing techniques

II.2.1. Lacquering (Sizing) and coating

Lacquering is similar to applying a coating layer on labels which either carried out online or off-press on a coater machine equipped with an anilox roller. The varnish was transfer from cells to the printed label sheets have dried. Lacquering aims to enhance printability and anti-peel off of inks on vary label substrate. Coatings, which may be UV or solvent or water bases, may be used at varying thicknesses based on density, type and depth of cells to suit the requirement or function of the label. Being a separate operation, lacquering increases the unit cost of the labels if no necessary.



An anilox roller and some popular types of anilox cells

Coatings whose nature and operations are the same with lacquering but it's applied at outer surface of labels. Coating purposes is to protect printing images, and provide high quality effectiveness such as clear, opaque or texture effects, etc.

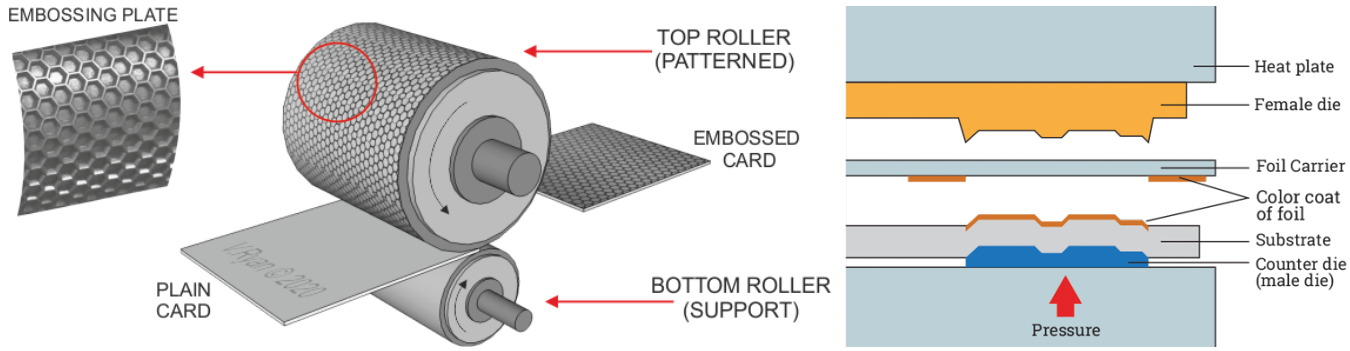
II.2.2. Bronzing

Bronzing is a means of creating a metallic appearance – usually gold – on wet-glued labels printed in sheets. These produce labels used for high added-value products such as expensive wines and spirits and cosmetics.

A special adhesive or bronzing base is applied to the designed areas to be bronzed, on a single colour, sheet-fed press. The bronze powder is applied to the sheet and then special dusting devices distribute the powder evenly all over the sheet but it only adheres in the treated areas. The sheet is then cleaned to remove excess bronze powder and burnished to develop the bronze lustre. The process is relatively slow and expensive so that it gradually replaced by hot-foiling stamping process.

II.2.3. Embossing

Embossing is undertaken between a male and female die. The female die is a depressed image, whilst the male die is prepared so as to push the label paper into the female embossing die to create a raised (embossed) area on the label design. Embossing is performed either by rotary or flat-bed embosser with a part or whole area of labels and is processed parallelly with the hot-foiling stamping process to produce the metallic-embossed effect.



Embossing processes under rotary or flatbed approach (heating may or may not be present)

II.3. Label finishing

Most labels have to be cut or punched to a specific size or shape as part of the post-printed stage in the label manufacturing process. The methods and techniques required to produce finished labels ready for application to bottles, cans or packs are:

- Guillotining to cut sizes
- Punching
- Die-cutting
- On-press slitting and sheeting (for some applications).

Special label-placement techniques may be used to apply the label to the container as well as techniques for folding, inserting or crimping.

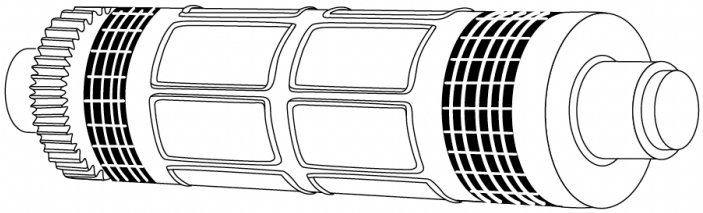
Label finishing was originally simple, mainly rectangles or squares, sometimes with rounded corners – followed later by circles and ovals. However, as the market developed further, the demand for unique shapes – which would aid recognition – increased and, with these new and challenging requirements, a whole new separate industry and technology servicing the label printer evolved. A guide to some of the main label-finishing options is as follows.

II.3.1. Straight cutting

Many labels are printed in sheets on offset presses with 100-150 labels on each sheet. These sheets of multiple labels, can require piles of up to 1000 printed sheets, must be straight cut, either for use as square or rectangular labels or before cutting out or punching to shape.

II.3.2. Die-cutting

Designed shape of labels have to be die-cut as part of their finishing procedure depending on the type of label and the printing or die-cutting requirement, the operation may be performed using high or hallow dies (ram punching), flat dies, rotary dies or, most recently, with digital die-cutting (laser).

Die-cut type	Description
High or hollow dies	used for ram punching glue-applied labels to shape, die knives are made of cold-rolled steel which is forged and welded to create the required shape and height. The inside of these dies is parallel for about 25 mm, after which they flare out. Sharpness of the die is critical, as are finished cut-label tolerances.
Flat dies	bending lengths of an accurately fashioned steel rule which has been finished to a cutting bevel along one edge. This rule is around 0.4 mm in thickness and nominally 12 mm in height. To form a cutter, the rule, once bent to shape using a special bending tool, is placed in a base into which the shape or shapes of the label(s) have been cut.
Rotary dies	Rotary dies are engraved on a solid steel cylinder to leave the cutting edge standing proud around the circumference. An alternative method is to use thin steel plates which have the die configuration etched over the surface. They are then mounted for use by wrapping the thin steel around a magnetic cylinder such as below picture. 
Digital dies	More recently, it has evolved from a laser-cutting technology used to cut out die-base boards before inserting the rule. The required shape and size of the label are programmed by a computer, with a laser beam and lens system used to direct the beam in cutting out the label shape. This method allows to quickly create a shape of any label without physical die-cut tool, yet it's just according to small quality and on demand due to its expensive.

II.3.3. Handling and storage

Most labels form a relatively expensive element of the total finished, labelled product. Labels are normally packed under bundles or rollers for available self-adhesive before delivery to end-use customers. In that, RH and temperature are two elements directly affecting their application and performance and also reducing the limited shelf life of self-adhesive labels and potential adhesive ageing.

These suitable conditions for storage are applied such as using PE film, or carton to protect labels from moisture and light, cold conditions are sometimes applied to preserve self-adhesive labels far away from hot temperatures which cause glue ageing, delaminate from the backing label, curling, etc.

II.4. Specifications, quality control of labels

II.4.1. Testing methods for self-adhesive labels

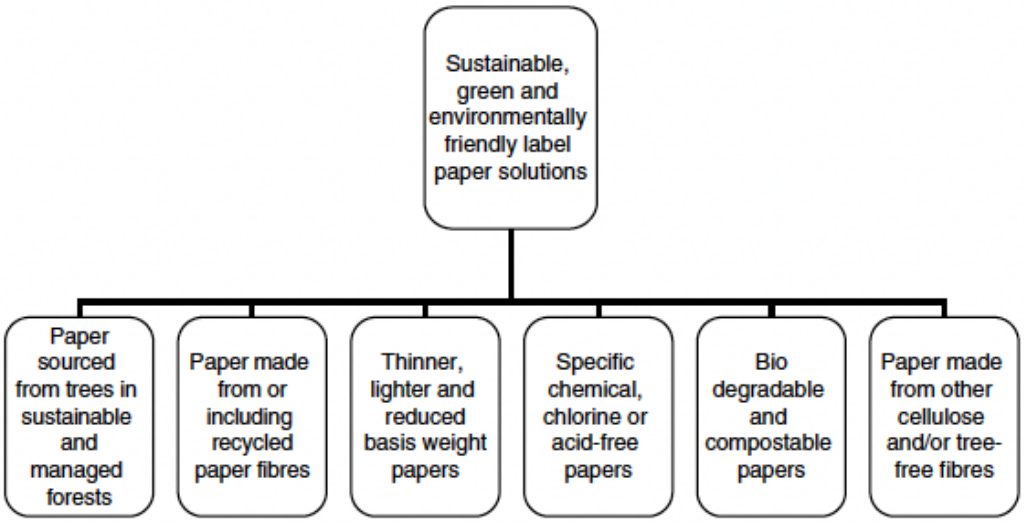
Test method	Description
Peel adhesion (90^o and 180^o)	Peel adhesion is measured performance and peel-ability using a tensile tester or similar machine that is capable of peeling a laminate through an angle of 180° with a jaw-separation rate of 300 mm per minute with an accuracy of ±2%. Adhesion is measured 20 min and 24 h after application – the latter being considered as the ultimate adhesion.
Resistance to shear	measure the ability of an adhesive to withstand static forces applied in the same plane as the label stock. Test method is defined as the time required for a standard area of pressure-sensitive coated material (using at least three strips) to slide from a standard flat surface in a direction parallel to the surface.
Quick-stick (or adheasive tack)	allow end-users to compare the 'initial grab' or 'tack' of different laminates. The quick-stick value is the force required to separate, at a specific speed, a loop of material (adhesive outermost) which has been brought into contact with a specified area of a standard surface. It is tested using a tensile tester which is similar to the peel adhesion test. The 'grab' or 'tack' value is of particular importance for automatic labelling equipment.
Adhesive coat weight	determine the amount of dry adhesive material applied to the surface of a pressure-sensitive label construction, adhesive coat weight is expressed as the weight of dry adhesive on a standard area of material – gsm. *(normally 11-18 gsm)*
Wash-off performance	Determine a certain period of a label that can peel off in a caustic solution 1-1.5% at 70 ±5 ^oC, stirring is applied to simulate conditions in the bottle washer. It regards time setting for labels cleaning out of glass bottles in returnable bottle washer.
Tensile strength for materials (MD/CD)	Test the elongation resistance of the label in all directions. The position of the labels on the bottle may be misaligned if tensile strength is not adequate. *(min. 1k N)*
High-speed release (10 m/min)	Check the minimum force that can be applied to separate the labels' face-stock and backing. This enables the design of suitable labels for the labelling machine, in which the gripper can take labels smoothly from the backing and then applying to the bottle at high-speed labelling. (*6-12 N/25 mm*)

II.4.2. Testing methods for wet-glue labels

Test method	Description
Tear strength	Testing is normally carried out using a tensile testing machine and a 10 or 15 mm wide paper strip to determine maximum force can cause label tearing on griper.
Water absorption capacity	is measured by the Cobb60 test (ISO 535 1991) to determine labels bind quickly and positively. Suitable labels should have an absorption capacity of between 7 and 11 g/m^2 after 60 s of water contact, low water absorption can lead to the edges lifting after application whilst excessive water causes curl excessively.
Caustic soda resistance	Test method has a meaning similar to caustic resistance testing on self-adhesive labels but applies to applied glue. Besides, it tests the resistance of label to the effect of disintegrating by caustic soda, whilst there should be no contamination of the solution caused by the 'pulping' of the fibres. *(≥ 60 minutes)*
Caustic resistance and penetration	This is similar to wash-off performance testing on self-adhesive labels. However, it helps to determine the adequate glue to apply on the back of labels, ensuring labels can wash off easily in the bottle washer. *Ex. An ideal penetration and wash off time of casein glue on wet-str paper labels are min. 120s and 180s.*
Paper weight	Test basic weight of paper label regards to bending stiffness, weight and water absorption capacity.
Bending stiffness	measure the flexural stiffness regarding the edge and side of the label being labelled properly. The high stiffness of the label may cause the edge to come off after being brushed. Soft labels can bubble label or hardly label release from the backing on self-adhesive labels.
Tensile strenght MD	It's similar to testing on self-adhesive label but determing the elongation resistence of labels at dry and wet conditions due to glue applied.

III. Label sustainability

Post-consumer packaging and label waste 'litter' sources have been increasing for many decades so it's time to come up with alternatives that make labels more recyclable and circular in the packaging chain such as use recyclable materials (numbered for sorting), biodegradable materials or hybrid materials (corn starch and other bio-label films, recyclable grades), etc.



Impact of the environment on label papers