substrate. The ratio of latex to polymer in a cold seal formulation should vary according to the film substrate to which it is to be applied. A white BOPP film for example may require a lower synthetic polymer content compared to a metallised BOPP due to the film's higher surface energy; therefore, a cold seal for a metallised film may contain less latex reducing the adhesive to adhesive bond strength.

The great advantage of cold seal is that the three main parameters governing the sealing process (pressure, dwell time and temperature) are reduced, with heat not being required at all. Without the necessity to control temperature, which is critical with plastic films, the only restraints to wrapping speed are mechanical. In addition, as heat is not required, the possibility of damage to chocolate products during machine stoppages is eliminated. Other benefits include reduced energy usage and wear on the sealing mechanism in addition to eliminating potential harm to operators and engineers from heated sealing jaws.

Cold seal adhesive should always be applied in a pattern on the inner surface of the film (see Figure 26.17) whether the film is a surface printed mono-web structure or a sandwich printed laminate film (print between two layers of film). Chocolate is capable of picking cold seal off the film when in direct contact; therefore, the pattern of cold seal must allow for the minimum possible contact between chocolate and cold seal adhesive.

Surface printed cold seal films employ "release lacquers" which should be applied as a smooth continuous layer at 1.5–2.0 g/m^2 (0.0049–0.0065 oz/ft^2) over the whole surface of the printed side of the film to prevent the inner layer of the film adhering to the outer layer of the film in the reel (known as blocking). Polyamide or nitrocellulose-modified polyamide is commonly used for such lacquers. Hot humid conditions may require special lacquers at higher coating weights to ensure good release in the long term.

Sandwich printed laminated cold seal films typically use a release laminate layer whereby the outer surface of the external layer of film is not receptive to the cold seal adhesive on the underside of the internal layer of film. In most cases, an outer homo-polymer layer in a BOPP co-extruded film generates the release property.

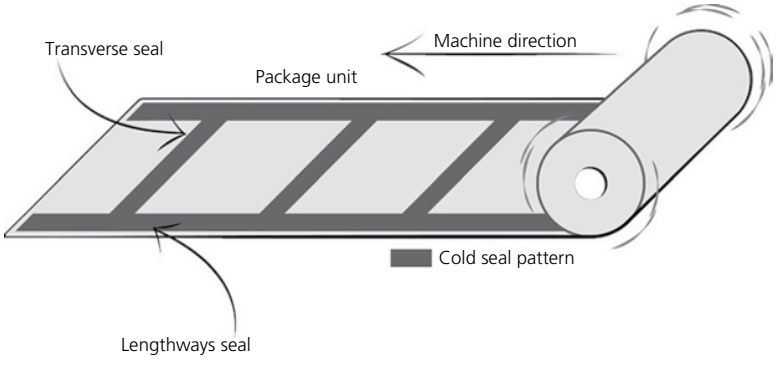

Figure 26.17 Pattern of cold seal application on a packaging film.

Cold seal adhesive films must be considered as a complete system whereby the substrate, ink, cold seal and release lacquer/layer must be compatible. Cold seal adhesive films theoretically have unlimited running speeds with countlines typically running 300–600 packs/min, although speeds up to 800 packs/min are known for smaller size countlines and moulded products.

Typical dry coating weight of cold seal adhesive is 3.5–5.0 g/m^2 (0.0115–0.0164 oz/ft^2). Synthetic cold seal adhesives are now available eliminating the use of natural rubber latex. Synthetic cold seals tend to require a lower coating weight typically 2–3 g/m^2 (0.0065–0.0098 oz/ft^2) to achieve the same bond strength as latex based cold seal. However, sealing bond strength should not be viewed as an indicator of seal integrity, that is a sufficient quantity should be applied to ensure flow (caulking) of the adhesive to ensure tight seals. At the time of writing, synthetic cold seal adhesive was not widely used due to the limited formulations available and significant on-cost compared to latex-based cold seal.

It is important to ensure that any inks used for overprinting or in-line marking (for example ink jet "best before" information) adhere to the release lacquer or release laminate sufficiently. The correct ink formulation must be determined when changing from a heat seal substrate to a cold seal substrate to prevent easy removal by rubbing off of the "best before" information.

Cold seal adhesive can be difficult to see, especially on white film; this can lead to difficulties in setting up the wrapping machine or in checking the presence and correct positioning of the cold seal in the sealing areas. Adding colour (generally light pink or blue) to the adhesive can overcome this problem.

Care must be taken when considering how to transport and store cold seal reels of film. Extreme cold within a reel of cold seal film prevents the formation of a good seal – should the internal temperature of a reel of film reach freezing point or just above, the sealing properties of the film will deaden, causing seal failure; the deadening is often reversible by reheating the film.

Tough plastic materials and cold seal have developed in parallel with the growing sophistication and availability of microprocessor-controlled wrapping machines. Together they have, in effect, removed the bottleneck frequently caused by the packaging element in an integrated production line and, at the same time, they have reduced operator supervision. The use of cold seal means that wrapping machines can speed up or slow down, giving an instant response to availability of product. This applies whether they are wrapping naked bars straight from an enrober or moulding plant, or collations of wrapped bars from a number of primary wrapping machines. At speeds of 200+ per minute, automatic feed systems and automatic boxing are essential, as is the automatic splicing when changing to a new reel of film. This avoids the need to stop the wrapping machine to renew the wrapping material.

26.4.6 Biopolymers

In recent years, both industry and consumers have become increasingly aware of the need for sustainability in many aspects of life, including the use of packaging materials. Conventional plastics are made from oil and gas feedstock that are