

Sustainable packaging on the shelf today - Paramelt turns to nature for the easy answer

Whether it comes to repellent properties to keep leaves clean or barrier requirements to prevent moisture loss in harsh environments, nature has a simple answer - Wax.

Today thousands of tons of paper based, barrier packaging is being commercially produced every year based on effective and sustainable vegetable wax technology.

For over a century paraffin wax has been used in a similar way to provide release and barrier properties to paper and board. Over recent years the industry has been working hard to harness a more sustainable solution based on renewably sourced vegetable fats.

By combining paper produced from responsibly managed forests with sustainably sourced fats it is now possible to produce a fully efficient packaging material based on over 90% renewable bio materials.

In a European setting all the talk today is about a shift towards a sustainable, bio-based economy. In the packaging industry this is being translated into many complex and expensive structures, combining bio-plastics with paper and other cellulosic materials.

For many existing applications however bio sourced wax can easily be overlooked as it seems just too easy... These products are commercially available and provide excellent barrier and release properties. They can be run on existing equipment and can meet all renewability and 'end of life' requirements.

Despite its long history, the use of wax paper today has been confined mainly to a small number of niche applications like confectionery packaging, cheese and meat wrappings; since it has been largely superseded by plastic films, extrusion coating or laminated structures.

Wax paper is frequently omitted in the teaching of packaging technology to today's engineers and is therefore often overlooked. In essence wax coatings are applied using exactly the same application techniques as water and solvent based lacquers, but without the need for drying or emission control, simply with the addition of a heated coating tray.

Despite a general lack of awareness, wax coated paper offers a significant number of benefits in the context of today's economic and environmental setting, which are leading to renewed activity in this area. This trend is evidenced by the strong resurgence of interest in wax coating lines as reported by the major machine producers

This renewed interest in wax-based solutions is based not only on the product itself but also on the comparative cost of production as against materials based on oil-based plastics and in its inherent environmental benefits.

Sustainability is one of the key societal drivers today in general it is a very difficult criterion to define. Essentially sustainability is the ability to endure which encompasses not only environmental aspects, but also social and economic considerations.

In a global context population expansion continues unabated, which will ultimately lead to significant challenges of delivering sufficient food in good condition to the consumer. For sure, flexible packaging will play an important role in meeting this challenge. In a European context however, the population is expected to be relatively stable and ageing, which will create a specific regional demand for functional packaging.

At the same time however there seems to be little prospect for significant growth in the coming decades with forecast of 1-1,5% being typical. Therefore any solutions to be found need to be cost effective and deliverable on existing technologies. Given the current global climate of fiscal uncertainty, short term investment is even more difficult to justify and for sure consumers won't want to pay more simply for green credentials.

On the supply side, Europe is strongly challenged in relation to the availability of natural resources, not least amongst which is oil. This drives the requirement to maximize resource usage efficiency and to move away from an oil based commodities market towards using more renewable materials. In closing the circle it is also important to consider what happens to packaging at the 'end of life', especially since there is little harmonized approach in relation to disposal or reuse across the region.

One area where Europe does largely meets its own resource requirements is in forestry for paper and board where currently over 90% of all fibre needed is European grown. This gives the paper and board industry a great platform as a packaging material of choice moving forward. The current challenge is to provide paper with the properties required to be an effective packaging material in an equally sustainable way.

In some sectors of the market, wax is ideally positioned to deliver these properties. Formulated wax coatings can provide the desired moisture and water resistance, excellent release from the packed goods, high gloss and a degree of heat sealability. They are also simple to apply and give excellent machineability on modern high speed packing lines with excellent slip and no static build-up,

Not only is wax-coated paper an effective and functional packaging material but many market studies have shown that people prefer paper. In an IPSOS study, 93% of respondents considered paper "more environmentally friendly", while 87% would choose paper because of "convenience factors" such as easy opening and controlled tearⁱ. Paper based packaging carries a number of positive messages to the consumer: it is seen as a traditional and familiar packaging medium which carries a high quality image and a responsible approach to packaging.. On a practical level, customers, especially the elderly, simply found paper-based packaging easier to handle.

Whilst paper has this widely held positive environmental perception, these benefits are often sacrificed by the need to introduce the required functionality through coating and laminating with conventional plastics. In many applications the same performance can be achieved through the use of wax coatings without compromising on either environmental or economic benefits.

Traditionally, oil based paraffin waxes have provided the basis for heat seal, gloss and laminating waxes in the packaging sector. These waxes are derived from a refinery residue stream and if not separated out, are cracked to provide additional monomer feedstock for plastic production.

In contrast to plastic coated paper however, wax coated paper is inherently biodegradable. Industry studies have shown that in the natural environment wax coated paper degrades at the same rate as leaf mulchⁱⁱ. More specifically appropriate wax coated paper structures meet the requirements for industrial composting according to EN 13432ⁱⁱⁱ. In addition, by using the right recovery process, wax coated paper is repulpable for use in recycled paper production^{iv}. In this way wax coated paper can offer a comprehensive solution in all 'end of life' scenarios, be that landfill, littering, recycling or composting.

Whilst this goes partway by addressing the 'waste issue', it does not tackle the renewability of the source material. In order to tackle this aspect Paramelt has invested significant R&D efforts to identify and establish sustainably sourced, vegetable based alternatives to close the loop in regard to sustainability. Under the brand name Nowax™ various vegetable oils and fats are modified and blended to provide direct counterparts of the traditional paraffin based materials. These Nowax™ coatings offer equivalent or superior performance to mineral based waxes.

By using these Nowax™ materials for the coating of paper, effective packaging structures are achieved which contain in excess of 90% renewable, bio based raw materials. This bio based packaging gives even further enhanced performance for end of life disposal or reuse.

There are a number of applications where wax coated paper retains a significant presence, despite the progressive dominance of plastics, driven by the low cost, ready availability and performance of commodity materials like PP and PE in the 1960's. The situation today is changed. The oil based economy will continue to be under pressure and society's awareness of the need to act responsibly in relation to resource use becomes ever more apparent. In this context, it is time to re-evaluate the most appropriate way to achieve the required performance.

While much of the focus has been applied to developing and commercializing novel bio-based plastics from a range of sources, perhaps a much simpler solution lies in looking at traditional materials in a new light. In existing wax paper applications areas (e.g. soft cheese packaging (Camembert, Brie), fast food packaging (hamburgers), confectionery (twist wrap and fold wrap) and corrugated and carton board impregnation) there is a strong case to be made for a switch back to waxed paper in direct substitution of plastic alternatives.

The use of vegetable wax based coatings not only has the potential to recover traditional market applications however. By improving the industry's knowledge and familiarity with the properties and processing of these materials, bio based wax coatings have the potential accelerate the expansion of bio economy in a more rapid and cost effective manner. On a square meter basis wax coated paper already stands direct comparison with mainstream packaging substrates such as PE coated paper, cast PP and PE films*** reference.

The decline in wax paper packaging began at the dawn of the new and emerging plastics industry. Since that time a lot has changed and despite erosion over the years, a strong and innovative wax coating industry remains. In today's context many of the criteria we use to specify and design our packaging have changed and bio based wax solutions stand ready to meet these challenging requirements. Many interesting new projects are now running across the industry and this resurgence is causing many to take a fresh look at this traditional packaging technology.

Nowax™ is a trademark of Paramelt B.V.

ⁱ IPSOS study, 'European paper packaging and paper labelling survey', commissioned by PaperPlus, Brussels, Belgium, published November 2006

ⁱⁱ A.O. Hanstveit, TNO, Netherlands, 'A study of the fate of waxed paper materials in a woodland litter layer', commissioned by European Wax Federation, Brussels, Belgium April 1991

ⁱⁱⁱ S Verstichel, OWS Organic Waste Systems, Belgium 'Compostability testing program Micropap', commissioned by Micropap, Paris, France, 2008

^{iv} A. Dumoittier, 'Valorisation – Recycling of sweets and chocolate packaging', Sweetpack symposium, Sibille-Dalle, Nice, France, May 1996