



The Tactile Effect.

Why sensory experiences matter more than ever in packaging.

WHITEPAPER





Haptics – brand gamechangers through packaging experiences

Haptic and tactile experiences are arguably the most important development in the print and packaging industry for years... going far beyond embossing, or using additives simply to alter the quality of a surface's coating.

The ability to put a captivating haptic experience in consumers' hands can be gamechanging for a brand, as well as the production partner with the ability to deliver this.

For packaging convertors, haptics represent an exciting opportunity to broaden your portfolio offering with products that meet your clients' demands for real stand out.

Similarly, for ink convertors, this is a chance to offer something new to your clients on this exciting journey... breakthrough products that are easy to formulate and perform across multiple end products, substrates and printing techniques.

In this document, we will discuss the science behind creating different textures and applying those textures consistently across different substrates. Then, thanks to Covestro's unequalled expertise in the field, we will share our learnings into how the human senses react to different textures, and why this is important to brands today.



The importance of touch

As touch is the second most important source of impressions after sight, it is easy to understand its importance in packaging.

Packaging was once just a means of conveying a product into a customer's hands. Now it helps to create a crucial first brand impression and plays a significant role in the customers' brand expectations. At the same time, modern coating papers allow us to elevate a simple plastic or carton packaging into something that can actively support a brand's image and positively affect buying behaviour.

It all started to gather pace over 15 years ago when Covestro introduced a water-based resin range for our very low gloss and haptic effect (such as soft touch) coatings. This one component technology has grown fast to become a major product line, consisting of a unique portfolio of water-based (optionally UV curable) resins.

Today, haptic effect and low gloss coatings represent a growing share of the coating systems that are used. "Look and feel" are core to the added value of any coating system: by providing distinctive and appealing visual and tactile properties to end consumers, soft touch matting coatings help set a product apart. As well as creating a pleasant feel, these coatings also offer desirable aesthetic features which help to create contrasting surfaces, reduced sheen and enhanced colour depth.

How one-component coating helps the packaging industry

Different industries use different formulations for soft-touch coatings, balancing cost and performance. More durable and chemically-resistant coatings usually cost more to produce. However, with polyurethanes becoming more common in soft-touch applications, luxury packaging now has a wide formulation base of excellent properties such as chemical resistance, scratch resistance, durability, weathering and ease of application across commonly-used printing techniques.





For color and touch, polyurethane dispersions hold the key to engaging haptic solutions

In the past, soft-touch coatings were predominantly two-component, solvent-borne polyurethane systems. The push to reduce the Volatile Organic Compound (VOC), content of haptic coatings led to a shift away from solvent-based formulations to waterborne or ultraviolet (UV) cured systems.

Today, a new waterborne UV-curable range of resins combines the same soft-touch properties as other waterborne polyurethanes, but with enhanced chemical and mechanical resistance properties.

These polyurethane dispersions (PUDs) form a matt, soft feel coating upon the evaporation of water, resulting in low gloss without the need for matting agents and/or additional crosslinking mechanisms.

As a result, they can be cast in ultra-thin films of 1–2µm dry, making them ideal for creating lightweight, luxury packaging. Also, thanks to their small particle size, typically up to 30µm (20–1000nm for Soft Touch), proper coalescence of particles when the coating dries results in a smooth surface.

Thanks to their lack of internal refractive index mismatching, these particles also allows for a high optical transparency, where the surface finish can evenly distribute light across a very thin sheet without any imperfections.

Now, thanks to Covestro's experience, we have been able to develop a one component technology that enables the synthesis of much larger, yet stable micron-sized polyurethane particles in water.

These are ideal for convertors looking to create highly-desirable aesthetic features, such as contrasting surfaces, reduced gloss and enhanced colour depth – and all on coatings which are only a few micrometers thick.



Haptic properties: how our fingers determine feel

As we move our fingers over a surface, the forces and vibrations generated by this frictional contact are detected by several types of neuroreceptors embedded in our skin. The signals from these receptors are processed by our brains and turned into what we refer to as a sensory experience of 'feel'. This is our haptic perception.

So you can see how the contact mechanics and frictional forces between skin and surface play a key role in haptic perception. As we touch a surface, the roughness of both skin and surface prevent perfect contact in the entire contact area. Generally, a softer surface deforms more easily, leading to more contact area and, therefore, higher friction.

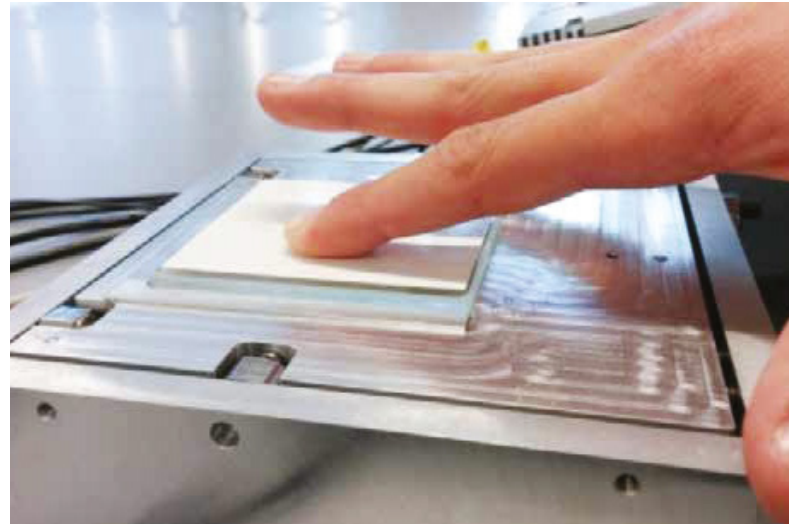
Covestro's unrivalled ability to measure haptics

To measure haptics, Covestro has constructed a finger friction measurement apparatus which allows us to study frictional forces generated on our materials during touch. This apparatus consists of a triaxial force cell, to which a sample surface can be mounted: this force cell simultaneously measures normal and tangential forces exerted on the surface, and this data can be used to calculate a coefficient of friction (cof), by dividing tangential force by normal force.

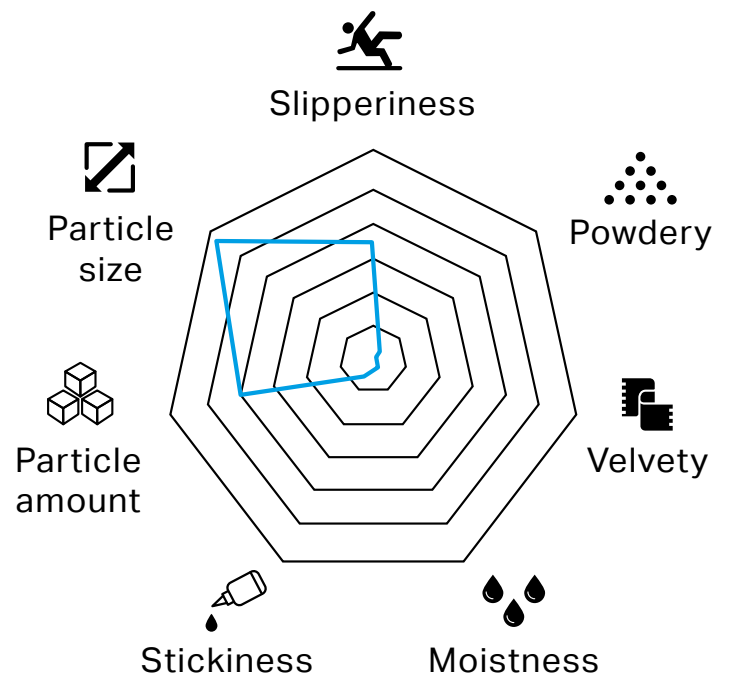
We can then break down any surface's 'feel' into 7 haptic sensory attributes. Each is measured against several reference materials so they can be scored on a fixed scale. Examples of attributes are:

- **Slipperiness** – how slippery the material feels
- **Velvety** – the sensation of fibres on the surface
- **Moistness** – how moist or dry the surface feels
- **Stickiness** – how tacky the surface feels
- **Particle size** – how rough the surface feels

This lets us create a 'fingerprint' of how something feels. Then, by measuring a broad range of reference materials (including silk, velvet, wood, paper, sandpaper, rubber), we can connect haptic products with the feel of a reference material.



However, it can be difficult to find the precise language to describe different haptic perceptions, as there is no universal agreement on what, for example, "silky" feels like, or how to judge which of any two surfaces is "more silky" than another. But we can start to quantify sensory experience through our human panel of sensory evaluators.



Quantifying feel: covestro's haptic sensory panel

The role of Covestro's haptic sensory panel is analytical as opposed to qualitative. They score coatings on various defined attributes to quantify the haptic perception of each. This lets us create a multidimensional perceptual space in which each of these coatings can be positioned.

By building the multi-dimensional correlation between the scores of the human panel and the material properties of the coating (such as modulus, surface roughness, coefficient of friction and heat conductivity) we can decide which physical measures can be used to tune the haptic perception – crucial as we look to develop new products.

Additionally, it helps us identify which physical parameters can be changed without influencing human perception.

This is crucial, as haptic perception is often not the only important property of a coating. So if, for example, the flexibility of a coating can be increased to improve scratch resistance, without any effect on the way the coating is perceived, we will be able to help create a coating with better overall properties.



The added value of touch and feel

Research has shown that the act of “getting to know” a product through touch increases the sense of perceived ownership. So the consumer is more likely to want to own a product if they like the way it feels. To prove this, several scientific studies have highlighted the marketing value of adding a ‘touch’ experience to packaging applications.

A project conducted by California Polytechnic State University delivered statistical evidence of consumers of cosmetics products preferring Soft Touch and Hi Rise coatings-based packaging over packaging without any added tactile benefits.

Moreover, the study cohort also indicated that consumers would be willing to accept a 5% price premium for products that were packaged with soft touch-friendly coatings – crucial for brands operating (or hoping to operate) in the luxury and high-end consumer goods segments.





The right soft feel experience – critical to today's leading brands

Luxury packaging can be recognized through the look and touch of the surface. As people touch a certain surface, the forces and vibrations generated in this frictional contact are processed by our brains into our sensory experience of "feel".

The soft and matt finish of a top-end mobile phone box, the smooth bevel of a perfume bottle, or the velvet feel of a premium Champagne package – they all play their part in communicating brand values at every single touch point. Soft structure and a unique haptic experience speak to quality and innovative craftsmanship, both virtues of luxury.

Different sensory coatings convey different feelings, and help ensure consistent brand reactions from consumers, regardless of the particular product contained within packaging:

- **Elegance** is silk
- **Efficiency** is matt
- **Warmth is** velvet

Uncoated papers, plastics or metals on the other hand, simply do not fulfil what top quality retailers and consumers expect. Instead, various varnishing, coating and printing techniques need to be applied to materials that will result in a luxury standard for packaging.



Appealing to the right senses

Research shows that the most important sensory system – in terms of how many impressions the system can absorb per second – is sight, which can process information at the rate of 10,000,000 bits every second.

More interestingly, touch is the second most important source of impressions, processing 1,000,000 bits each second, but on a much narrower bandwidth (or rate).

So this underlines the value of a quality, and appropriate, sensory experience based on touch, and also the need for colour consistency across every physical touchpoint where a brand meets the consumers.

Sensory system	Total bandwidth	Conscious bandwidth (bits/sec)
Sight	10,000,000	40
Hearing	100,000	30
Touch	1,000,000	5
Smell	100,000	1
Taste	1,000	1

Whether it's for a gift box, subscription box or e-commerce packaging, adding haptics to a carton box design is an effective way to improve the customer unboxing experience.



In conclusion

Brands are constantly seeking new opportunities to increase brand recognition by their customers. This is why haptic coatings play a key role in differentiating their packaging.

With the creation of one-touch coatings and PUDs that can be cast onto ultra-thin surfaces, we are entering an era where existing machinery and skills mean that high quality finishes can be created quickly and at higher volumes than previously thought possible.

For formulators and convertors looking to grow their businesses, a broader portfolio will result in more partnerships and the chance to take a more proactive role, by recommending different textures and finishes to clients.

As a leading player in this market, Covestro's expertise and ongoing research, such as the sensory panel, means we are the ideal partner to support you in adding a feel like silk, rubber, velvet or sand onto your packaging.

Covestro coatings can be used on a range of plastic substrates including PE, EPT, PA and PP.



Key take-outs from this paper

1. Our brains rank touch as the second most important source of impressions, processing 1,000,000 bits each second on a narrower bandwidth than sight.
2. Haptic experiences help to create a crucial first brand impression and are key to meeting customers' brand expectations.
3. Leading brands are demanding a broader portfolio of surface finishes, especially on lightweight luxury packaging.
4. Consumers of cosmetics products prefer coatings-based packaging over untreated packaging and would pay a 5% price premium for products with soft touch-friendly coatings.
5. Covestro's haptic sensory panel can quantify the human perception of coatings and to correlate these with physical coating properties.
6. Covestro has demonstrated the ability to produce one component stable micron sized aqueous polyurethane dispersions (PUDs) that give coatings a matt appearance and a haptic perception, such as soft touch.
7. Colour consistency can be achieved and enhanced by casting PUDs in very thin films (0,2 mu) with a high optical transparency, allowing the surface finish to distribute light across a very thin sheet without any imperfections or the need to add further matting agents.



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¹Please see the "Guidance on Use of Covestro Products in a Medical Application" document.
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