HID Global Composite Cards

Executive Summary

For years, access control card users have used standard identification credentials made from laminated PVC. While PVC is useful for laminating around the electronic components in access control cards, some customers find the inexpensive and widely available material less durable for demanding applications. With age or stress, PVC may get brittle and could crack.

HID Global has developed a new composite technology to address the physical wear-and-tear demands on access control credentials. With advantages over the standard PVC card in thermal stability or heat resistance, and in flex and impact strength, the new HID composite card provides customers with a high durability option in card ordering.

Problem/Issue

When issuing cards, it is critical to take into account the needs of the end-user. Often, the expectation of cards that are to be issued once and to last for an eternity is met by the reality that conditions (or users!) can cause undue wear-and-tear on a simple access control card.

"Only you can prevent card abuse"
(source: http://www.naccu.org/press/nr-caulastics_abusedcards.htm)

Some customers complain that they have seen higher-than-acceptable card failure rates due to excessive handling or extreme use conditions. In other cases, cards usually worn outdoors can suffer from UV exposure, rendering card performance less-than-optimal. In applications like university campus cards or industrial applications, with heavy use of magnetic stripe and bar code, cards see heavy wear-and-tear. This wear-and- tear is the death knell for a card, as users must frequently replace cards adding to the administrative expense of issuing and maintaining credentials.

Additionally, some card customization techniques like reverse transfer print technology and polyester patch lamination, run at higher temperatures than the original direct-to-card dye sublimation printers, adding a burden to the card's integrity at creation.

While each of these situations and applications is understandable, a card needs to be able to withstand any type of abnormal physical abuse placed on it.

Most standard ID cards are made from laminated PVC (copolymer polyvinyl chloride sheet). The material's fairly low softening point and ability to stay soft over a wide temperature range makes it useful for laminating around the electronic components in an access control card. PVC is an inexpensive and widely available material. But the traits that make it suitable for laminating cards also make it less durable in demanding applications. When stressed or aged in lab tests, PVC tends to get brittle and can be prone to crack.

PET (Oriented Polyester) has very high heat resistance, tear strength and impact strength. It is an expensive material (about five times the cost of PVC) and has a longer purchasing lead time. A PET card will not break and it will not deform in high temperatures. But it will not soften when heated to normal lamination process temperatures, so by itself it is not an acceptable material for laminating prox or contactless smart cards.

How Composite Cards Work

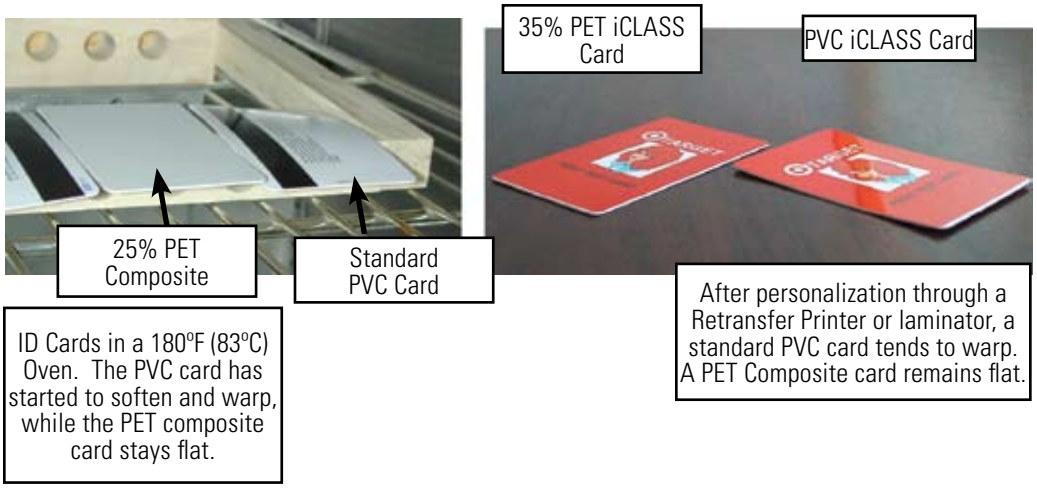
Composite cards combine PVC and PET to benefit from the best attributes of both materials. The electronic components (prox or contactless smartcard inlay) are laminated in a PVC core, and this core is surrounded by PET sheet. The outermost layer is clear PVC to keep the card compatible with direct-to-card Photo ID printers. The standard card product is built to meet ISO thickness for contact chip embedded cards (.030"), and is approximately 25% polyester. An even heavier-duty card can be made by using a thicker polyester sheet. That card is .035" thick (still OK with magnetic stripe readers) and is 35% PET. For sites using embedded contact chip cards, the standard .030" thick version of these cards must be used. See diagram on page 4 for construction details.

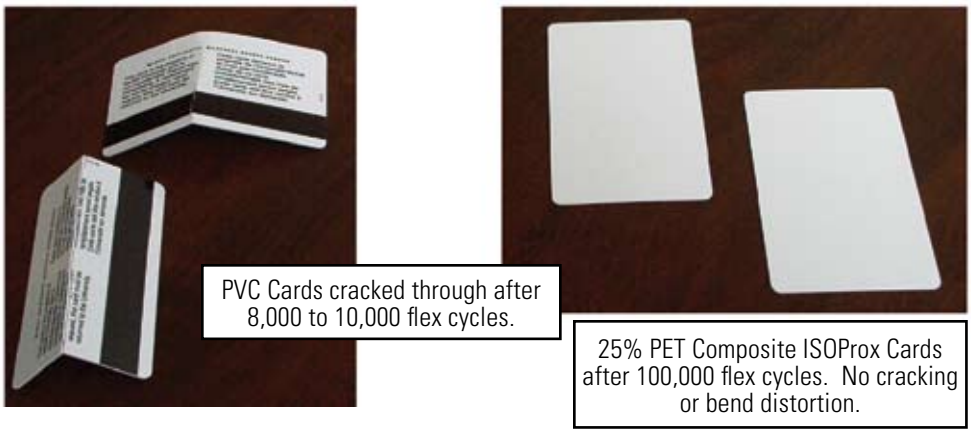
The composite card has advantages over the standard PVC card in thermal stability or heat resistance, and in flex and impact strength.

Thermal Stability: The card is built with a PVC core, and PET outer layers to provide better heat resistance. PVC begins to soften at about 140ºF (60ºC). That is lower than the lamination temperature in many Photo ID printers when applying a polyester patch. The PVC card will warp as shown in the photo below. The PET material itself is not affected by heat as high as 300ºF (149ºC), but since the card still has a PVC core, it will warp at a sustained temperature of 220ºF (105ºC). In retransfer Photo ID printing and polyester patch applications, the card stays flatter.

Newer Photo ID printing technologies, with faster machine throughput, reverse transfer print technology and polyester patch lamination, all run at higher temperatures than the original direct-to-card dye sublimation printers. 100% PVC cards work well with the lower temperature technology, but the internal chip and antenna become more visible and the card warps with the higher printing temperatures. The polyester composite construction handles the higher temperature without distortion.

Field performance depends on the user' machine settings, but in Photo ID lamination tests with a retransfer printer with laminated patch film, the standard PVC card warped as much as .060" – unacceptable in most applications. The more polyester in the card construction, the flatter the card will stay. The 25% PET card warped slightly at .025" (still within ISO flatness specifications). The 35% PET card stayed flat within .010" – a barely noticeable curl. Both cards perform much better than standard PVC cards.





PVC Cards cracked through after 8,000 to 10,000 flex cycles.

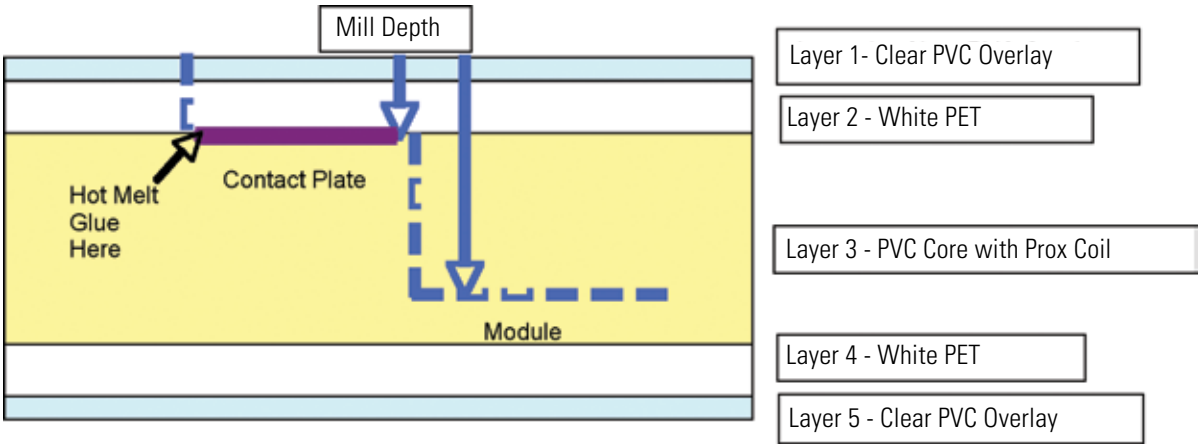
25% PET Composite ISOProx Cards after 100,000 flex cycles. No cracking or bend distortion.

Flex and Impact Strength: PET is a more durable material than PVC. It has greater flex strength – resistance to breaking from flexing the card back and forth, and it has superior impact strength – more resistant to snapping or pulling a badge holder through a slot punch. This makes the card the better choice in demanding, high use applications.

There are several ISO durability tests for ID cards. One simply flexes the card back and forth, similar to a user holding the edges of the card, and squeezing it to flex it. A PVC Prox card will crack and break after approximately 8,000 cycles. The composite cards will last more than 200,000 cycles, and even then will not crack through. The clear PVC outer layer starts to break down, making just the outer surface of the card crackled.

Another test holds the card on edge, and slams it, under weight, against a solid surface. A standard PVC card may crack under that impact, especially after accelerated aging with heat or UV light exposure. The PET composite card will simply flex and straighten out again. In both cases, the polyester material protects the card, and the internal electrical components, from breaking due to flex or impact.

Chip Embedding : Both PVC and PET composite cards are suitable for contact chip embedding. There is an important difference in the module installation process. PVC cards can be assembled using cyanoacrylate adhesive – a very quick and relatively inexpensive process. In the composite card, the mill depth for the contact plate is still in the card's polyester layer, or at the interface between polyester and PVC. Hot melt adhesive must be used to guarantee adhesion of the contact plate to the card.



How HID Composite Cards Solve Problem

Built for environments where cards see a high degree of wear-and-tear, HID Composite Cards are made from a unique blend of plastic materials. The result is a more rigid card, providing additional protection in high-use and harsh environments.

The new HID Composite Cards provide the following benefits:

- Greater durability and longer card service life than PVC cards, resulting in fewer card replacements over time.
- Less susceptible to cracks or tears from bending/handling,
- Internal card components are better protected than in PVC cards.
- Composite material is ideal for Reverse Transfer printing and Photo ID patch lamination because card stays flatter than PVC cards.

The new Composite Cards are available in all HID access control technologies – iCLASS, Prox, Mifare, DESFire, Mag Stripe, and combination cards. Like all HID ISO Cards, the composite cards can be customized with high quality full color graphics, security and anti-counterfeiting features (UV fluorescing inks, microprinting, embedded and surface holograms).

Conclusion

HID's product engineers have developed a new technology to provide customers with a high durability option in card ordering.

Whether for new card installations or customer card reorders, customers can order the new Composite high durability plastic cards (with additional protection in physically demanding environments) or the standard PVC plastic cards (suitable for many traditional access control applications).