DuraTech Industries

Presents

# In-Mold Electronics (IME)

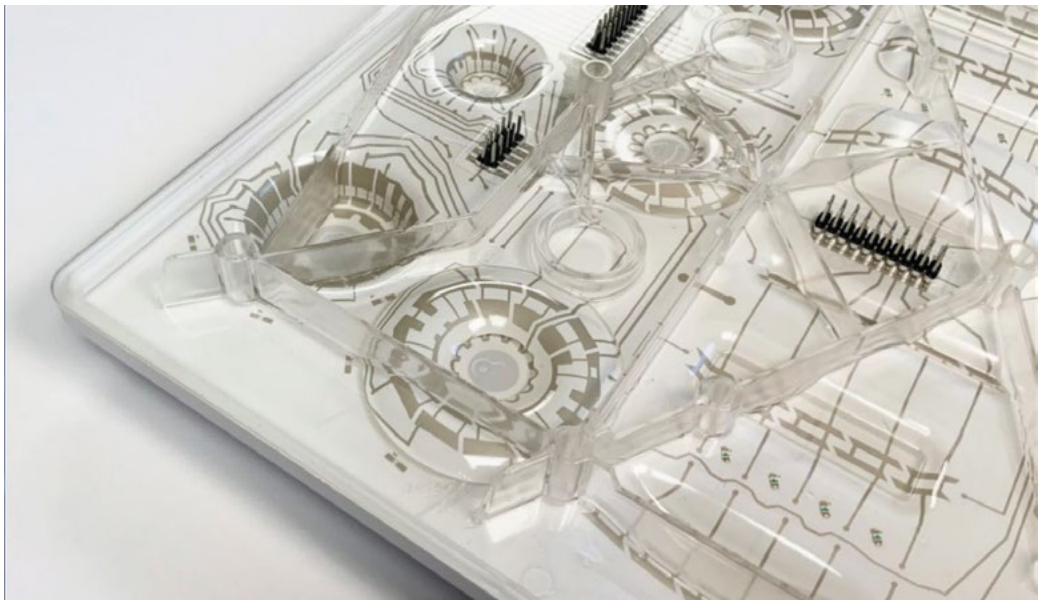

IME is the combination of a printed graphic, printed electronic traces and injection molding.

The result is a cost effective plastic part with integrated circuitry.

In-Mold Electronics makes “dumb” surfaces “smart”.

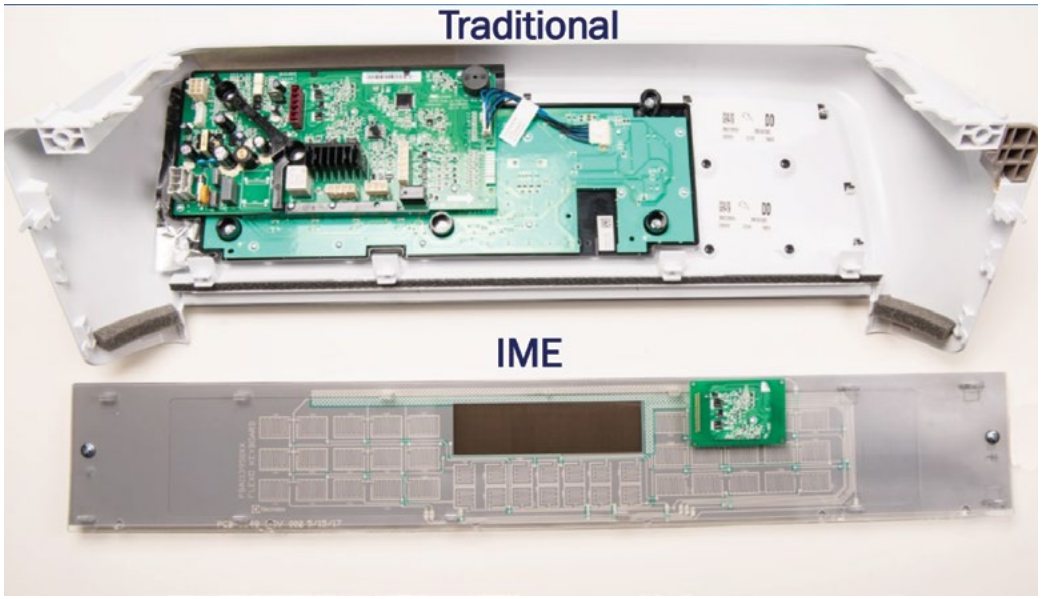
## Design freedom:

Inks and substrates can conform into complex, thin shapes allowing for more 3D design latitude.



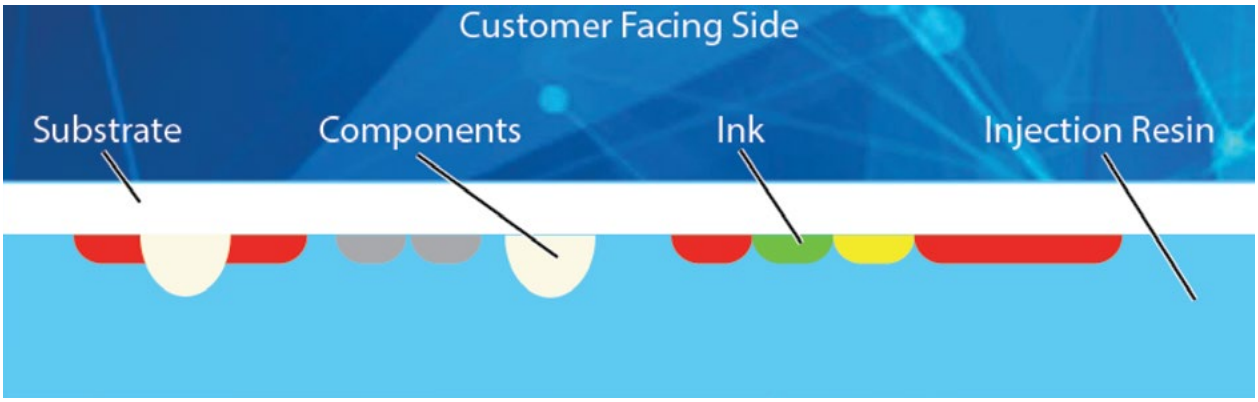
## Smaller PCB's

The PCB can be significantly smaller since it doesn't have to be behind all the switches and lights. PCB standardization even with switch quantity and location variation.



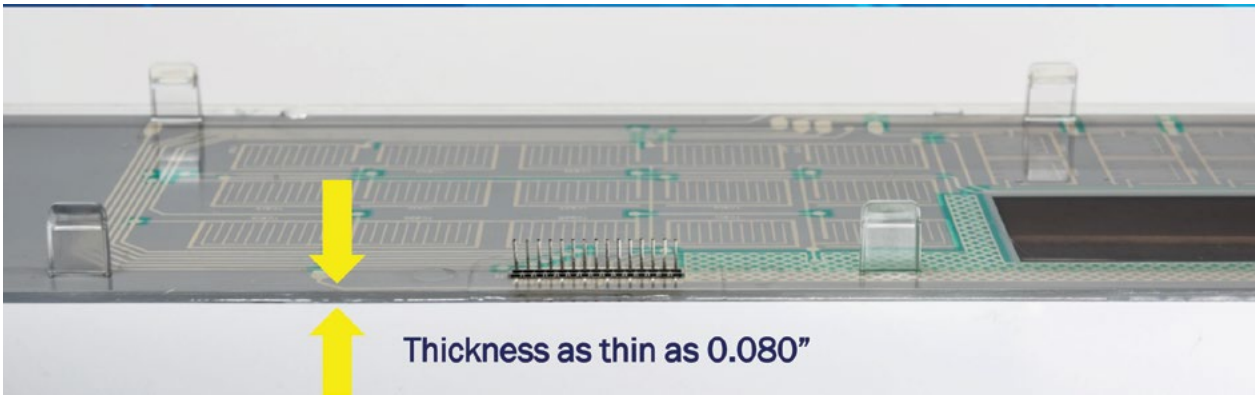
## Durability:

Printed electronics and components are encapsulated in resin to protect them from the environment.



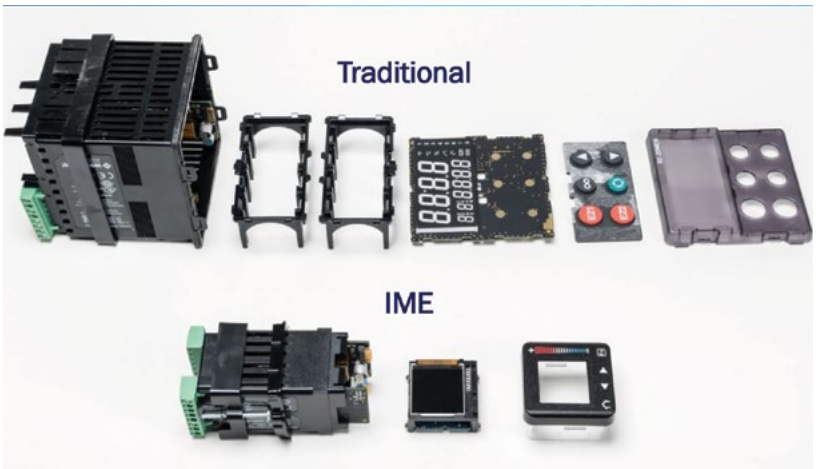

## Reduce Weight:

Reduced electronics weight by 70% and assembly depth by up to 90% creates tremendous opportunities for designers & engineers.




## Reduce Bill of Materials:

Reduced BOM and increased ease of manufacturing. No switches to connect, no misalignment of LEDs to graphics.

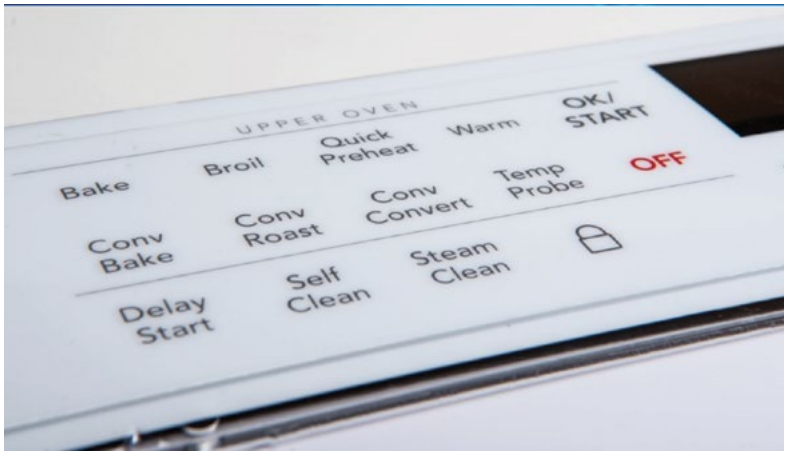


## Haptics:

Haptics can be added as needed to enhance the user interface.

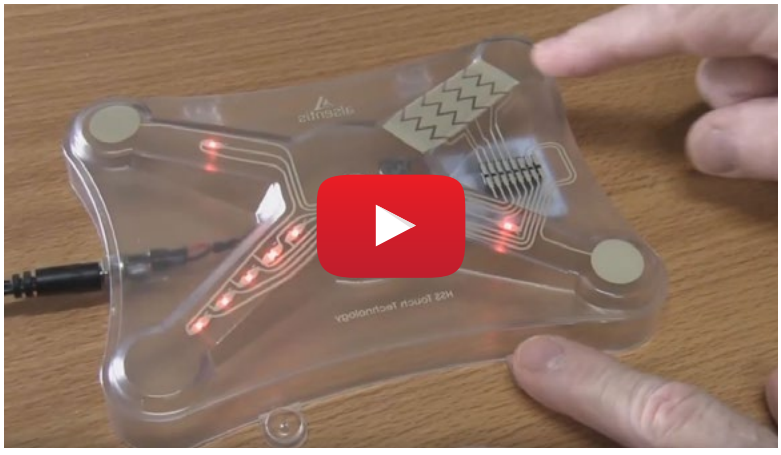
## Sealed Surfaces:

Products that need thorough cleaning, no cracks and crevices around switches or buttons for dirt and bacterial to hide.




## Hydrophobic:

Liquid rejection through tuning - no false actuations when cleaning or in outdoor environments.



# Types of IME Construction

## Back molded:

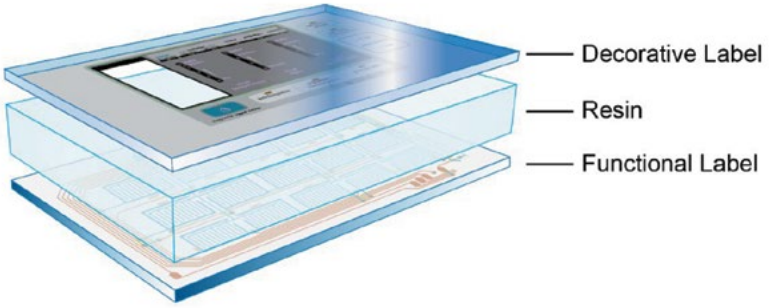
- Resin molded behind label containing graphics and electronics
- Embedded connection (header)


## Over molded:

- Resin molded in front of label containing graphics and electronics
- Connection to the circuit can be made post molding as a secondary operation. Chip on tail is also an option


## Dual label:

- Traditional in-mold decoration label on front and IME circuit label on back with resin molded between.
- Allows for more substrate options on the first surface (e.g.: gloss material).
- Elimination of header or ink telegraphing through to the first surface.



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# IME
## In-Mold Electronics

### DESIGN CONSIDERATIONS

In order for IME to be successful, projects need to be designed for manufacture. There are design guidelines and manufacturing limitations that need to be considered.

**Interconnect**
How do we connect the circuits we print to the control board?
- Tail vs No tail
- Shutoffs and witness marks
- 2 label approach
- Overmolding

**Forming around SMD components**
- LEDs
- Resistors
- ICs

**Substrates**
- Hardness/Impact resistance
- UV resistance
- Chemical resistance
- Formability
- Dissimilar CTEs between the substrate and molding resin

**Ink systems**
- Graphics inks – prefer UV inks that can be run on high speed equipment
- Functional inks – What are the resistances requirements or forming requirements.
- Adhesion promoters – Can we marry our ink systems with the selected resin system.

**IME CAPABILITIES**
Capacitive touch buttons
Linear and radial sliders
Scroll wheels
LED indicators and icon backlighting
Resistive heating elements in plastic
Eliminate wiring harnesses by routing traces through existing plastic parts

**DESIGN ADVANTAGES**
PCB's are rigid and cannot be formed. This limits the design freedom for the industrial designer. IME with molded 3D shapes and the use of formable inks offer design freedom for customers to differentiate their products in the market place. 3D User Interfaces open up a whole new toolbox for industrial designers and engineers

**DESIGN EFFICIENCIES**
IME uses the internal volume of a plastic part to route electronics and reducing the overall space needed. By encasing the electronics in the plastic, overall weight and space can be saved. The IME process removes some volume of plastic resin and replaces it with electronic components which reduces the weight of the PCB.

**HOW DOES IME DIFFER FROM IMD/IML?**
IMD/IML are graphics only
IME can be the addition of electronic circuit inks to an IMD label or a stand alone circuit and includes an electrically functional component.
- HMI
- Sensors
- Heaters
- Placing circuitry in real estate that is normally unavailable
- Smart Surfaces

3216 Commerce Street • La Crosse, WI 54603 • 608.781.2570 • www.duratech.com • info@duratech.com

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# DuraTech Industries

Duratech has been printing engineered graphics for 44 years.

Two manufacturing locations.

Approximatlry 400 employees worldwide.

Duratech developed the first IMS device 8 years ago.


Contact:

Richard Cousin

Regional Manufacturers' Represetative

rich@bontrolsystems.com

925-256-1414

www.bontrolsystems.com