Flexible Hybrid Electronics (FHE) Overview
in cooperation with NextFlex Manufacturing Institute

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Imagine... If we can...

- Bend our phone and put it in our pocket without damaging it
- Monitor human health and detect life-threatening conditions
- Measure stress and detect potentially catastrophic faults in physical assets (vehicles, aircraft, equipment and structures)

and ....

- Control our security

All of these are possible utilizing Flexible Hybrid Electronics (FHE)
To understand the story better...

Here are (8) aspects covered...

- What is FHE?
- What Makes FHE Different?
- How Will FHE Affect Us?
- What is so Interesting about FHE?
- Who is NextFlex?
- Example FHE Application
- FHE Assistance
- How to Engage SMMs with the Institute
The applicability is not only just for large manufacturing corporations

But also for small and medium size manufacturers (SMMs)
Path to New Technology Adoption

A SMM, Must answer the questions:

“What is the Technology / Mfg Technology?”

“How does the technology apply to my business?”

“Can I improve my business by adopting the technology?”

“What do I need to change to adopt the technology?”

- People, Process & Systems?
- Plant & Equipment?

Awareness ➔ Exploration ➔ Business Case ➔ Execution

* ** ***
What is FHE?

FHE (Flexible Hybrid Electronics) combines the flexibility and lower cost of printed plastic film substrates with the performance of semiconductor devices to create a new category of electronics.
Bringing Together the FHE Supply Chain Ecosystem

- Equipment
- Contract Manufacturing
- Industrial/ Aerospace
- Materials
- Research
- Device/ Component Manufacturing
- Medical/ Wearable Devices
- Raw Materials
- Supplier
- Manufacturing
- Customer
- Distribution
- Semiconductor
- Process Technology
- Industry Standards
- Economic Development
What Does FHE Enable That is Different?

Taking Electronics out of the Box...

...and Making it...

- Flexible
- Stretchable
- Conformable
- Transparent
- Biocompatible
- Lightweight
- Cost effective
FHE Examples

Standard rigid PCB to FHE conversion test sample

Wireless body temperature measurement circuit
Where Can FHE Be Used?

- **Portable Devices**
  - e.g. Plastic film to place components on printed structures
  - Conforming to size is important

- **Mobile Devices**
  - Thin is a requirement
  - Disposable at high volumes

- **Size, Weight or Power is Important**
  - Low Cost at high volumes

- **Disposable at High Volumes**

Your “Use Case” here...
How Will FHE Affect Business?

OPPORTUNITY

Many new products in:

...Healthcare, Fitness, Apparel, Aerospace, Medical Devices, Automotive will be available soon, using FHE manufacturing technology.
Why Would a Business Be Interested in FHE?

Because:

- The market is large
- Demand exists in supply chain for US-owned small mfg.
- Larger manufacturers want small mfg. as suppliers
- Adoption assistance is available for FHE

$13 Billion

Opportunity
Prepare Now!

For:
- New revenue streams
- New supply chain demand
- Your competitive advantage
- Obtain new skills
- Assistance in FHE adoption

Time to Plan
What / Who is NextFlex?

NextFlex: Bringing Together Existing Capabilities

Disparate FHE Capabilities
- Centers of excellence with world class capabilities; Project-based interaction
- Evolved out of established, once US-led technologies

MII Funding Helps Connect Manufacturing
- Silicon Valley hub provides critical mass to ‘pull’ industries together
- Fills missing infrastructure in modeling, design, new assembly, and test
- Creates links between today’s separate capabilities, existing assembly and end-user needs
- FHE leverages other industry eco-systems and marketing channels
- Relationships and communications ensures efficiencies in investments
Example of a Conversion: Medical Device to FHE Conversion

Early Prototype “Patch”

Patch Components Details
Who CMTC is:

- CMTC is a 501-C3 non-profit Corp, is California’s Manufacturing Extension Partnership (MEP) Center and is affiliated with the National Institute of Standards and Technology (NIST)
- CMTC provides services to assist small and medium-sized manufacturers to generate profitable growth

Serving Manufacturers Statewide

Who NextFlex is:

A Public-Private Partnership

- Established: 28 August 2015
- Lead: FlexTech Alliance
- Hub: San Jose, California
- Proposal: 145+ in 27 states
- Contributors: Federal Funding $75 million over 5 years
- Committed Matching: $96 million
- Government Agencies: 17 DOD & OGAs Engaged
Nationwide Network Engagement
How to Engage with SMMs and the NextFlex Institute

• Awareness, education (briefings)

• Training (on-site, remote)

• Networking (connecting with supply chain partners)

• Adopt FHE manufacturing tech (supplier/subsystem integrator)
Path to New Technology Adoption

For an SMM, answers the question:

“What is the technology?”

“How does the technology apply to my business?”

“Can I improve my business by adopting the technology?”

“What do I need to change to adopt the technology?”

• People, Process & Systems?
• Plant & Equipment?

For CMTC, confirms:

*S Sponsor + ** Project + *** Budget & Timeline

= SMM is ready for technology pilot
Summary

Key Points:

1. FHE is a new manufacturing capability, Not a new technology
2. FHE is enabling new innovative applications
3. A FHE wave is coming, creating demand
4. Be aware of it
5. Prepare for it
6. Take financial advantage of the FHE opportunity
The END
If you are planning a trip to the San Francisco Bay Area, be sure to STOP by and visit the

NextFex facility
2244 Blach Place suite 150
San Jose, CA 95131

(( looks like a long driveway off Fortune Drive, only about 5.5miles from San Jose Airport ))
What is FHE?

P-types:
- Screening
- Aerosol
- Inkjet

S-types:
- Active devices
- uProcessor
- uController
- Memory

FS-types:
- PET
- PEN
- Paper
- Glass
- Ceramic
- Metal film

Printing
Flexible Substrates
Semiconductors