PFAS in consumer electronics

- challenges and opportunities on the road to circularity

Anna Forsgren
Product Compliance & Sustainability manager
Marshall Group

Agenda

- Why & where pfas?
- Learnings and achievements
- Challenges
- Key takeaways

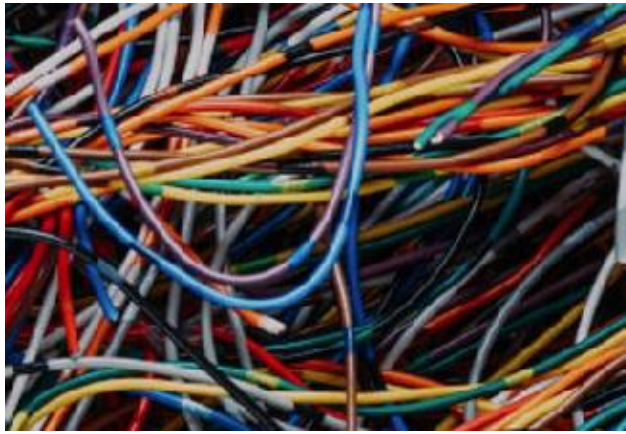
IN 1962, JIM & TERRY MARSHALL REVOLUTIONISED GUITAR AMPLIFICATION


Over 35 million products shipped
800 employees 8 offices
150 artists endorsed globally
380 million usd annual revenue

Why PFAS in consumer electronics?

Marshall

Flame retardants, water resistance and lower production costs



Flame retarded plastic in product housings as

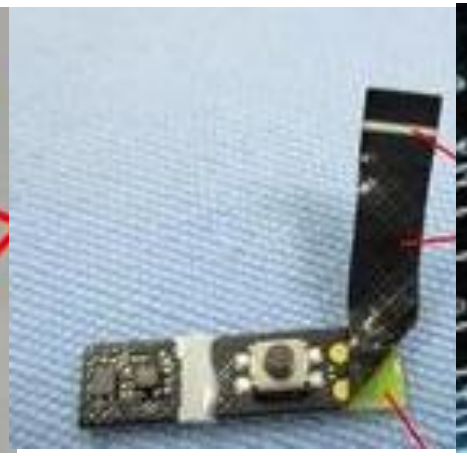
- **Cabinets**
- **Charging cases**
- **Ear caps**
- **Ear buds, etc**

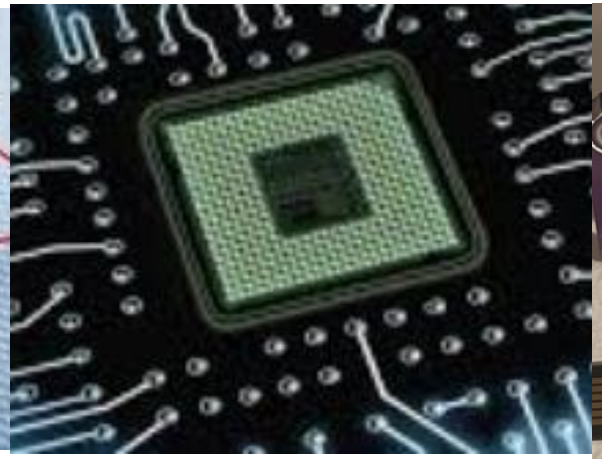
- **Printed Circuit Boards (PCBs)**
- **Coatings on PCBs in water proof/resistant products**

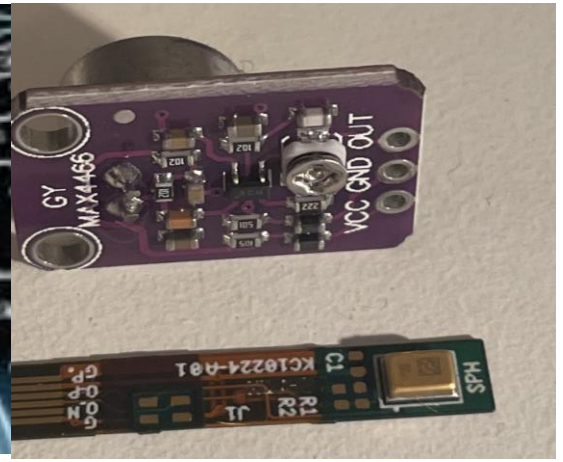
Plastics in

- **Power cables**
- **Charging cables**
- **Internal wires**

Separate or keep electrical polarization state







Li-ion batteries
- **Electrolyte**
- **Separator**
- **Enclosure**
- **Coin cell tape**

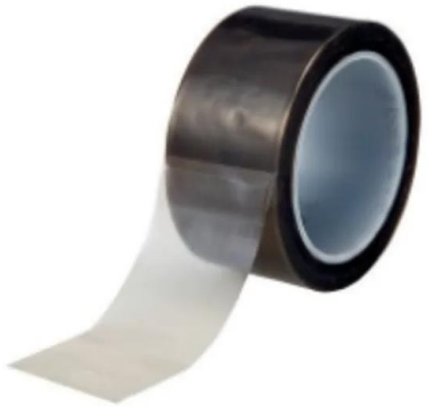
PCBA frame

Semiconductor production

Microphones

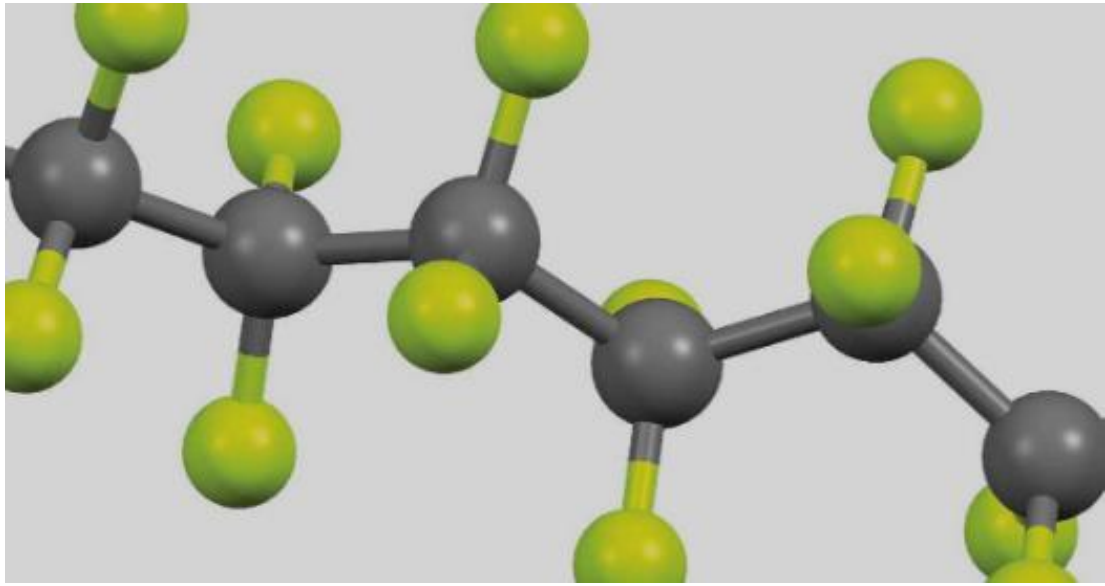
Protect, lubricate and separate

- Sensor protection film
- Teflon tape in 5-function switch
- Electric switch gears
- Capacitors
- Protective vents
- Mesh
- Moisture proof fret
- Moisture proof glue to prevent dent
- Lubrication oil



What PFAS are used?

- So far around 20 different substances found
- Most used
  - PTFE
  - FEP
  - PVDF
  - Other flouropolymers



Understand function to assess alternatives

Work with the alternatives in different ways – may be new

- **Chemical**
- **Material**
- **Component**
- **Supplier**
- **Design**
- **Technology**

Is it possible to not use PFAS in consumer electronics?

YES!

- ALL applications so far have a PFAS free option technically possible
- Some applications may need compromises and time for development – but there are options
- Alternatives so far non-toxic:
  - Avoiding many other flame retardants too by the design around
  - Mostly shift to PE, silicone, wax and acrylates

But it costs much to phase out PFAS in consumer electronics?

No!

- Do Halogen test only - simple and cost efficient. F in organic material gives good reasons to believe there is PFAS involved.
- Flame resistant plastics cost more
- Increased knowledge in materials -> more design and component improvements, saved costs and motivates employees
- Some applications cost more initially due to development, lower quantities etc, but difference should decrease over time

Progress so far

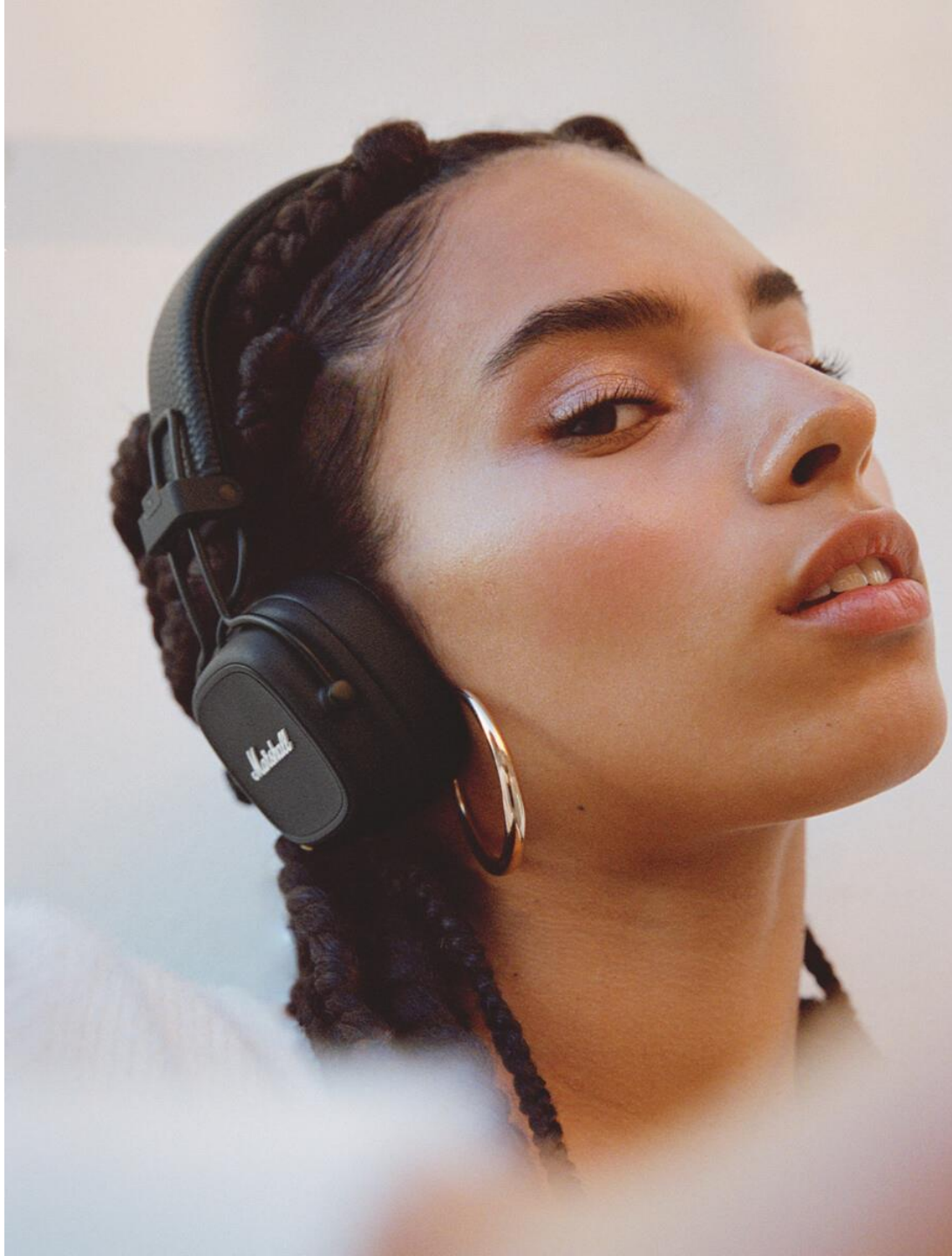
- ✓ Design around to avoid flammability requirements of construction plastics
- ✓ PCB coatings
- ✓ Tapes
- ✓ Lubricant oils
- ✓ Antenna wires
- ✓ Driver wires
- ✓ Battery wires
- ✓ Switch tape
- ✓ Membranes
- ✓ Vents
- ✓ Glue
- ✓ Frets

Development ongoing

- ✓ Batteries
- ✓ Cable plastics
- ✓ Anti-drip agents
- ✓ And so on

Collaboration in industry needed

- ➢ Semiconductors
- ➢ Switches and gears
- ➢ Flammability certification requirements

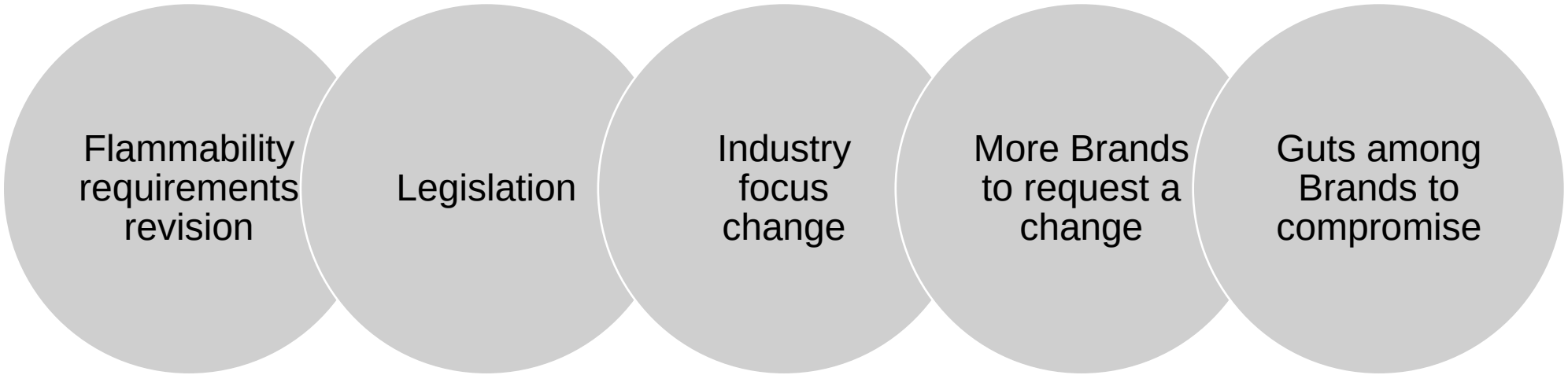


Electrical safety standards need a more holistic approach

- Needed but should be adapted to risks
- Certification with high costs, long lead times and lack of advice make seeking options costly
- Changes require specialized expertise and takes very long time to change
- Are international but not globally accepted –> still need PFAS for certification in several APAC countries

➢Should be developed with coming regulations, global acceptance and the high innovation speed of the sector in mind

What is needed to remove PFAS from consumer electronics?



Need from policy makers

Regulations	IEC alignment	Industry & commercial requirements
Ban of entire PFAS group 	Integration with electrical safety standards 	• eco-design • circularity schemes • sustainability certifications • lifecycle assessments • public procurement

Key takeaways

- Consumer electronics is full of PFAS
- Most applications can be PFAS free if required
- Focus on training, engagement, collaboration and innovation instead of derogations
- Electrical safety standards must align with upcoming regulations – and much faster

Soon launching Emberton III our first “PFAS low” speaker

Acknowledgements

- **Lisa Skedung at RISE**
- **Jonathan Kleimark at ChemSec**
- **Ian Cousins at Stockholm University**
- **Torben Pedersen at GN Hearing / Jabra**
- **Institute for Green Science Policy**

Marshall

THANK YOU