Applications of heat conductive plastics

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SMART WPC

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Content

- Introduction
- Why it is needed
- Applications
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- Conclusion

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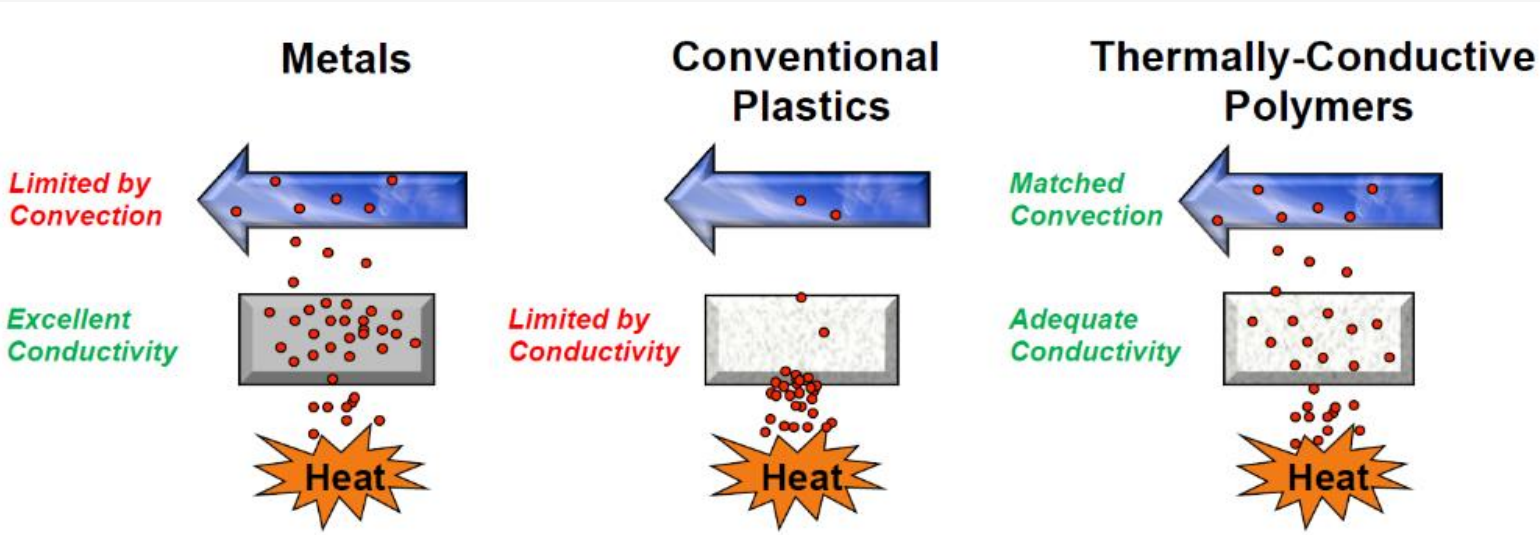
Inroduction

- Convection limits heat transfer more than conductivity
- Advantages of high conductivity are lost

Material	Thermal conductivity (W/mK)
Copper (pure)	399
Aluminium (Pure)	237
Aluminium alloys	80-220
Iron (pure)	80,2
Steel	15-50
Plastics	0,15-0,5
Thermally conductive plastics	1-40



David Stonecipher, Eduardo Alvarez; Replacing Traditional Materials with Polymers for Next-Gen LED Luminaires; Polyone; LEDs Magazine.

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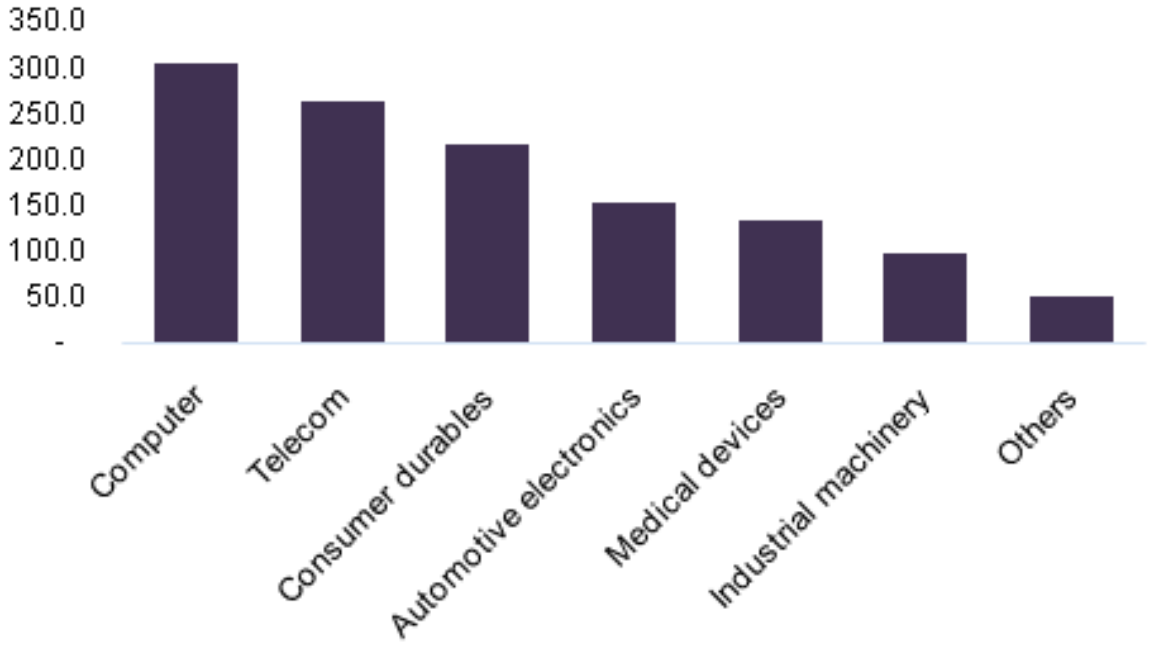
Driving forces

- Miniaturization
- Cost saving
- Protection of electrical equipment
- Increase in production of electrical appliances

Market

- Market [1]
  - 2018: 174,1 M$
  - 2026: 326,1 M$
  - Annual growth of 7,8%



Global thermal interface materials, by application, 2015 (USD Million)

[1] Global Newswire; Reports and Data; Thermally Conductive Plastics Market Type, Carbon based solutions (Natural Graphite powders, Synthetic Graphite powders, Conductive carbon blacks, Silicon-carbon composites, Water dispersions and Others), Applications and End User - Global Forecast 2026 Is Forecasted to Reach USD 326.1 Million By 2026

Grand view research, Thermal Interface Materials Market Analysis By Product (Tapes & Films, Elastomeric Pads, Greases & Adhesives, Phase Change Materials, Metal-Based), By Application (Telecom, Computer, Medical Devices, Automotive Electronics) And Segment Forecasts, 2018 – 2025; Published Date: Nov, 2016

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Factors affecting conductivity 1/2

- Structure
  - Backbone
  - Side-chains
  - Cross-linking
- Crystallinity
  - Stretching
  - Annealing
- Fillers

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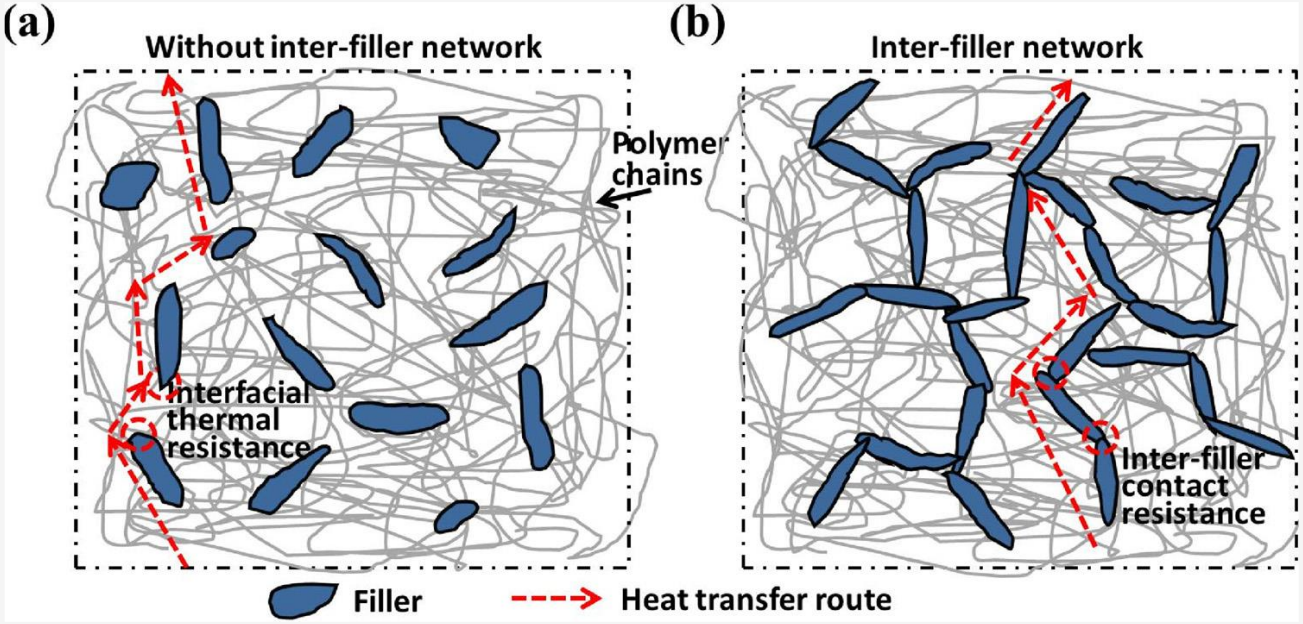
Factors affecting conductivity 2/2

Filler materials

- Metals
- Carbon
- Ceramics

Affecting properties

- Conductivity
- Shape
- Size
- Distribution
- Loading



Huang et al. 2018; Thermal conductivity of polymers and polymer nanocomposites; Material Science and engineering: Reports; Elsevier

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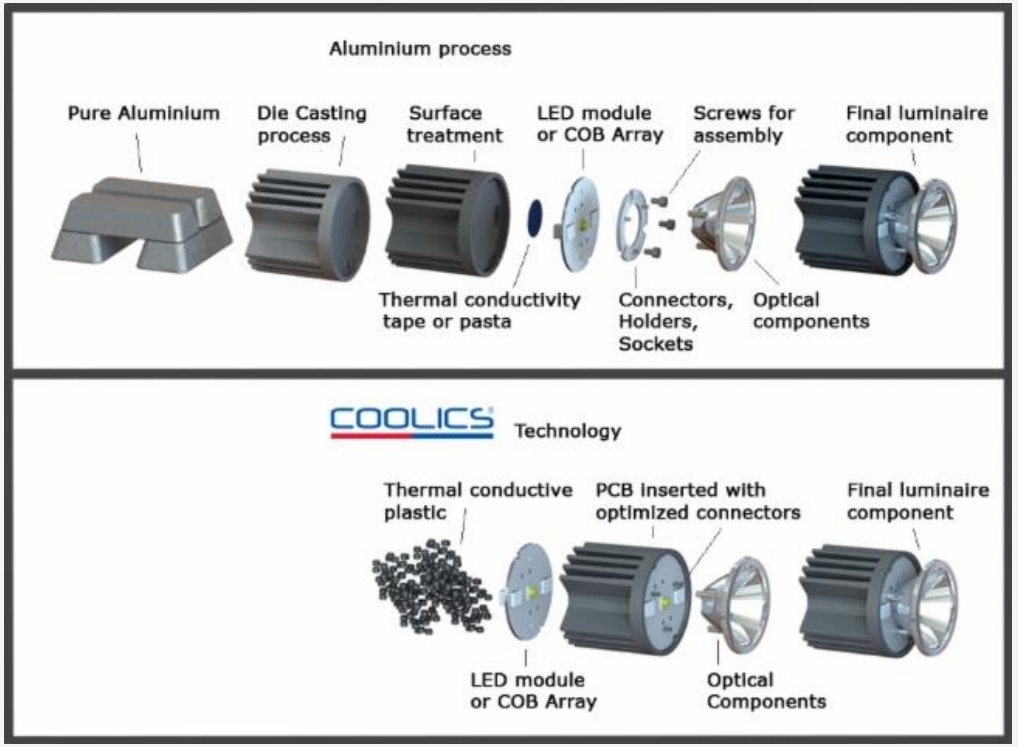
Advantages over traditional materials

- Freedom of design
- Lighter weight
- Possibility of electrical insulation
- Corrosion resistant
- Reduced part count
- Quicker cooling
- Colorability



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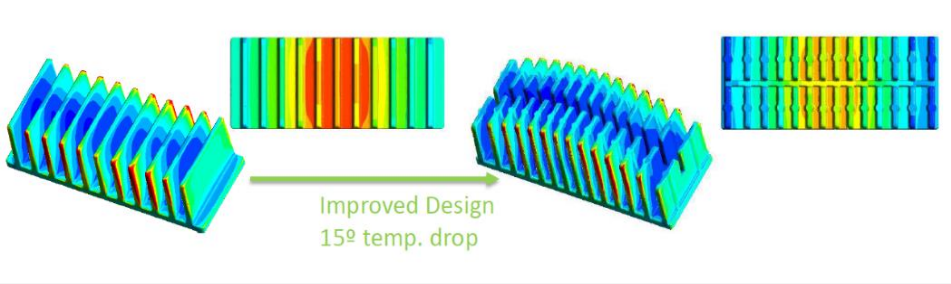

Celanese Corp, Darin Grinsteinner, Thermally Conductive Thermoplastics:Problems and Solutions for Automotive Heat Management Systems

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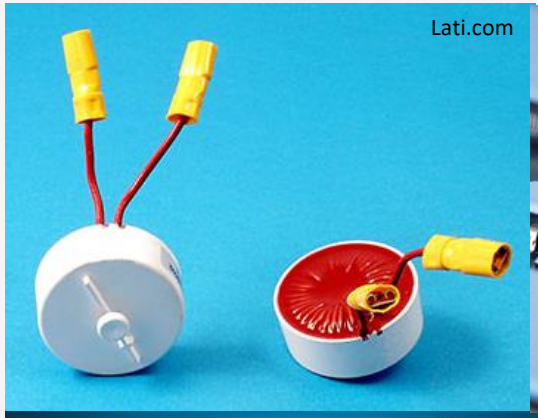
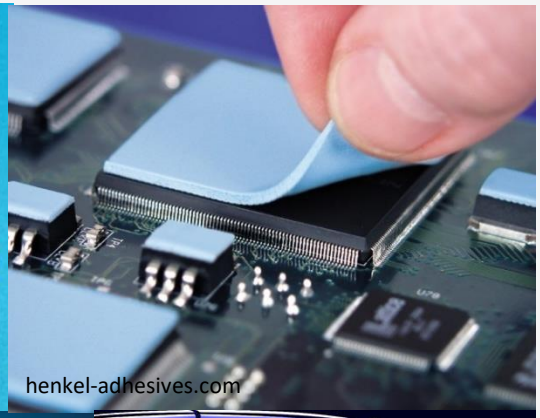
Applications

- Heatsinks for electronics
  - Heat dissipating casing
  - Thermal interface material (TIM)
  - Reflectors
- Overmolded electronics
- Temperature sensors
- Circuit boards
- Heat conductive coating
- Heat exchangers
- Floor heating pipes





PolyOne.com

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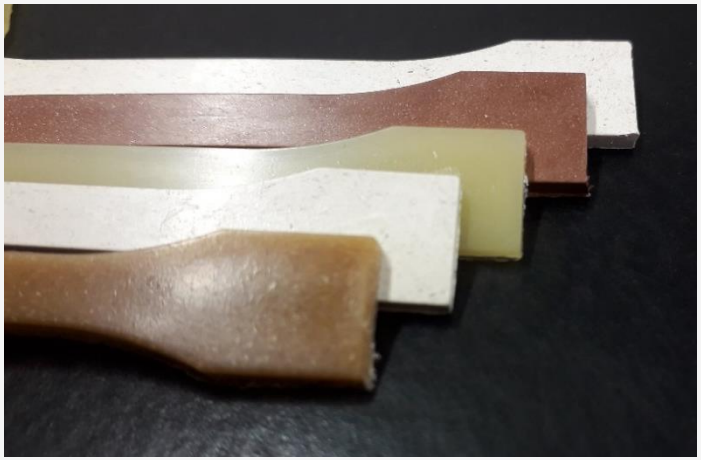
Conclusion

- Thermally conductive plastics are mainly used in high power density applications
- Thermally conductive plastic industry is fast growing area
- Wood fibers increase thermal conductivity in our tests
  - Through distribution?



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Thank you for your interest!