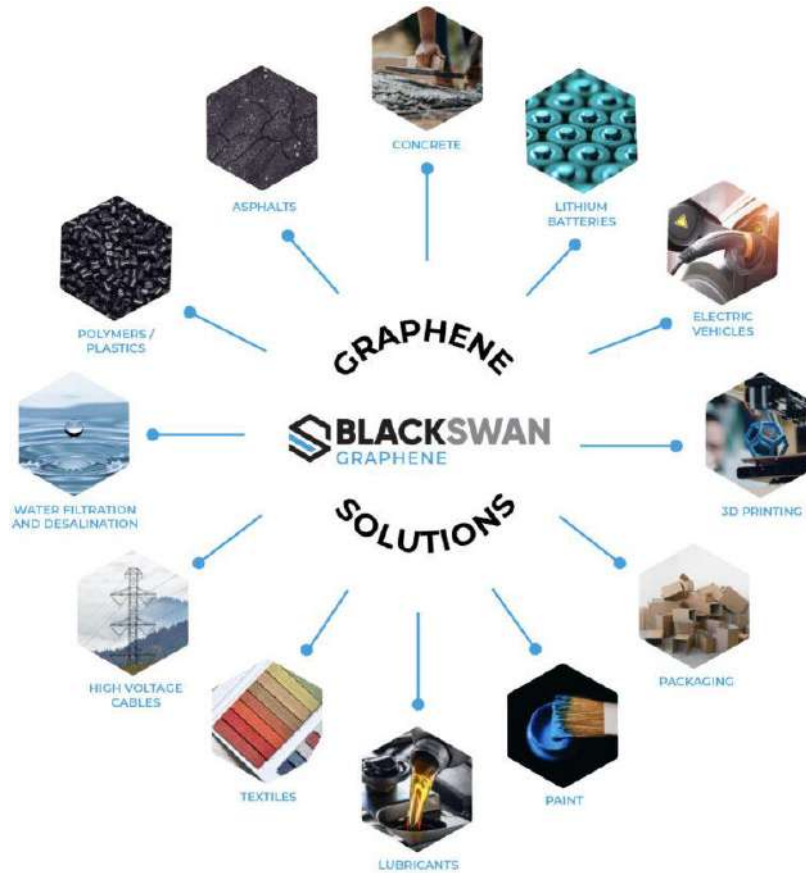
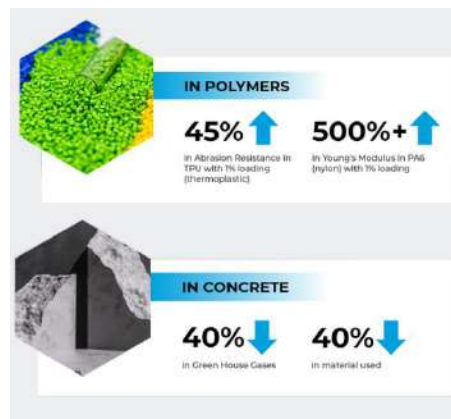


## WIDE APPLICATION



## PRODUCT PERFORMANCE

Ready to revolutionize countless industries, Graphene brings a remarkable performance boost to key products. Building materials with massive increases in both compressive and tensile strength, faster charging batteries, and concrete that emits far less GHG in construction all make the case for the wonder of graphene.



## INITIAL TARGET MARKETS

### Concrete

- Large market – over 20 billion tonnes of concrete a year consumed
- Potential for 2,000,000 tonnes of graphene demand (0.01% loading)
- Concrete responsible for 8%+ of global greenhouse gas emissions
- By injecting graphene, the same strength can be achieved by using up to 40% less concrete
- Other benefits, such as a 400% decrease in permeability
- Greatly increases the life of the concrete as it prevents the internal swelling due to moisture (alkali-silica reaction), which leads to cracking
- Reduces or eliminates the use of rebar
- Low graphene price required to be competitive



### Plastics (polymers)

- Plastic additives market: ≈\$40B annually
- Graphene is a potential game changer for polymers as it allows not only better performance but opens up new applications
- Multiple benefits of bulk graphene as an additive:
  - Light weighting: weight reduction for transportation; replace metal parts with stronger plastic parts, accelerating the adoption of EVs
  - Lower costs: less polymer for same strength
  - Better Precision: allows plastic parts to compete with metal parts for precision
  - Improves the gas permeability: can be used to improve anti-corrosion properties
  - Thermal conductivity: improves polymer performance especially in thermally challenging applications




### Tires and other Rubber applications

- Carbon black market: ≈\$18B annually (12Mt), approx. 60% to 70% used in tires to improve traction, durability and rolling resistance
- Bulk graphene can make a better performing or cheaper tire depending on loading and is a greener product compared to carbon black which is made from tar and requires larger volumes
- The challenge for the graphene industry is to provide large quantities of production at low costs
- 5 large and 200 small carbon black producers with potential to become market participants (ex: distributors) given potential to realize better margins and existing customer base.



## MARKET OVERVIEW

Broadly speaking, graphene improves product performance and generally reduces costs for the customer. Just like carbon fibre experienced in the 1990's, graphene market penetration is expected to accelerate rapidly with lower production costs and product availability.

		Potential annual graphene requirement (tons)	
Material	Annual production tons	Loading ratio of 0.0001	Loading ratio of 0.05
Concrete	20,000,000,000	2,000,000	1,000,000,000
Polymers (total)	250,000,000	25,000	12,500,000
PE	72,500,000	7,250	3,625,000
PP	47,500,000	4,750	2,375,000
Base Oil	35,000,000	3,500	1,750,000
PVC	27,500,000	2,750	1,375,000
Rubber*	27,000,000	2,700	1,350,000
PS	18,750,000	1,875	937,500
PUR	17,500,000	1,750	875,000
PET	16,250,000	1,625	812,500
PA	5,000,000	500	250,000
Epoxy	2,500,000	250	125,000
High performance polymers	20,000	2	1,000

Source: The Graphene Council, The Graphene Report 2021 (\*Of which synthetic is 14.5M tons, natural is 12.5M tons)