

Life Cycle Assessment of Bitumen



Introduction

The Life Cycle Assessment is used to determine the environmental affects of each material used within construction. Schemes such as BREEAM (Building Research Establishment Environment Assessment) have pushed this forward within construction in the UK. BREEAM was established in 1990 in the UK and is now used in over 76 countries worldwide.

Bitumen is a viscous liquid which is used for various products. 85% of all Bitumen products were used to bind with other components to create asphalt. Asphalt is used on roads and paving’s. Over 102 millions tones of bitumen is produced each year.

With asphalt being used for the majority of roadways, paving and airport runways it is difficult to restrain the Bitumen industry when it comes to protecting the environment.

Bitumen is stored at around 250°C and when being installed it needs to be transferred maintaining that heat. As soon as it starts to cool it will go harden and will have to be broken down and reheated to have the ability to re-use.

Issues the Bitumen industry faces

- Create a solution for longer lasting products e.g. roads
 - Reduce carbon emissions
 - Make the installation a safer process
- Reduce the amount of Crude oil used as it is a fossil fuel and there is a limited amount.

Extraction A1 & A2

As crude oil is the source of Bitumen an oil refinery will be needed to extract that from the ground. Crude oil is a fossil fuel found deep below the earth’s surface. Once it is extracted it is transported via boat or truck in storage containers. Saudi Arabia produce the largest amounts of Crude oil. This will then be shipped to various countries to create Asphalt.

Construction B1-B7

Bitumen is used in multiple materials. Bitumen felt is a product that needs to be torched down with high temperatures flame. This system does not need to maintained and can last over 30 years as a roofing product. This releases vast amounts of CO2. CO2 is also the main gas released when installing roads with Paving Bitumen. Paving Bitumen also known as Asphalt will last for approx. 15 years before it will need a full renewal. If it is well maintained within the time period it can last up to 25 years.

Production A3

Crude oil is pumped into the furnace and heated too 370 °C. Next it is put through various distillery chambers before being oxidised for specific bitumen products to be produced. When being mixed with rock sand and various other materials; Asphalt is produced.

Demolition C1 & C2

As bitumen is a bonding agent it is extremely hard to remove unless cut away. When bitumen asphalt is on roofs or paving it will need to be removed as a whole before a new system can be installed, unless it is in a reasonable condition and then it can be over-laid. This requires a lot of time and labour. It can be transported in a any type of vehicle once deconstructed.

Transport A4

Once bitumen has been created from the crude oil, it can be transported via pipe but only when it is mixed with a fluid with a lot less viscosity as Bitumen is to thick to be pumped. Another alternative is via Boat or Truck. It can be transported at a heat of over 160°C. This takes a lot of energy to transport bitumen as constant heat is required. 90% of all Bitumen is transported this way.

Disposal C3, C4 & D

Bitumen is classed as hazardous waste and therefore would need to be dealt with in a specific way. However, the majority of land fill sites have a specific site for bitumen products. Bitumen can be recycled; over 50 million tonnes of Asphalt Paving was recycled in 2013 in Europe. The recycling of Paving Bitumen Asphalt is booming in 2020 as it is extremely cost effective as there is no purchasing of crude oil. Going forward this will be huge of the Bitumen asphalt industry.

Conclusion

In conclusion, Bitumen is a material which is used worldwide and is extremely popular when building any infrastructure. The challenges which it now faces is the environmental damage that it is causing to the planet. The CO2 emissions and the methane that is released from not only the process of creating bitumen but from the extraction of the crude oil to the transportation methods to get to a bitumen refinery to then create and transport the hot bitumen to the location needed thus releasing an extortionate amount of CO2 and various other harmful gases.

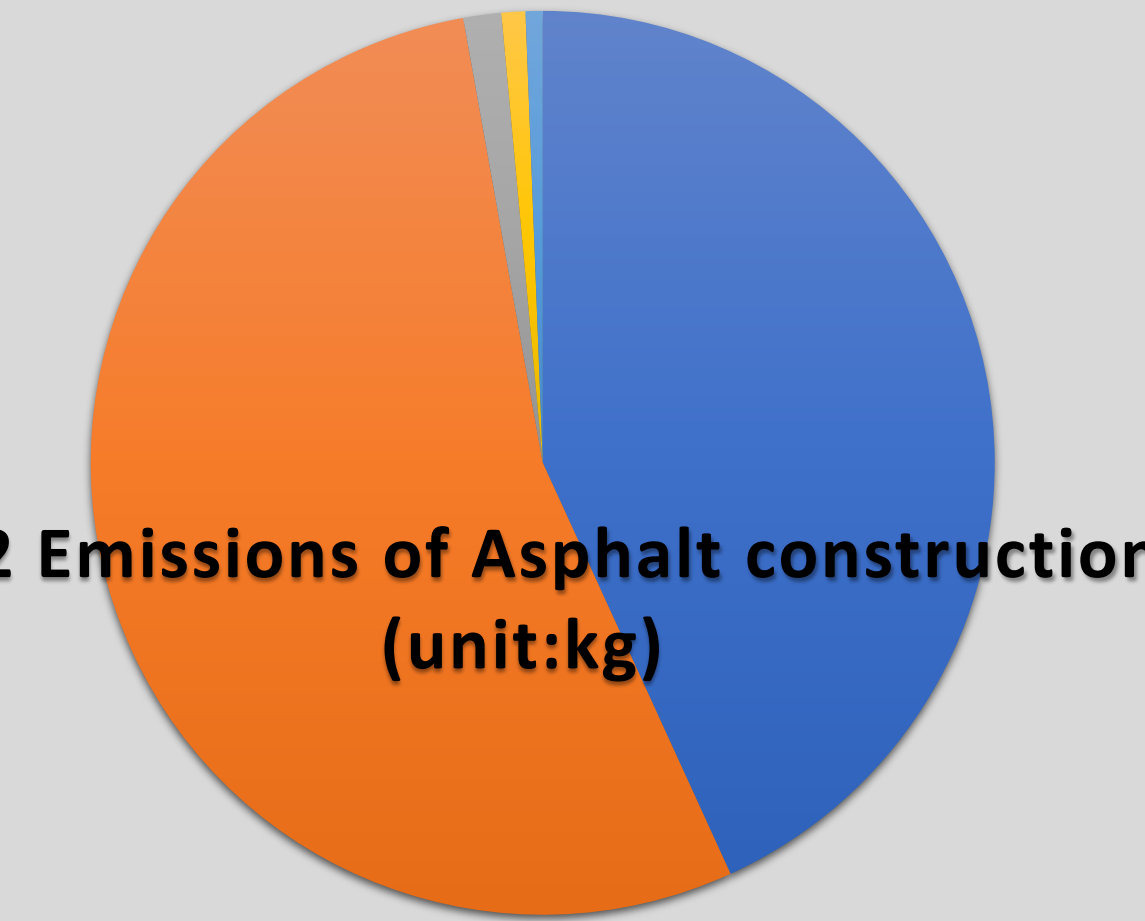
Further to this the recycling of asphalt is becoming ever more present with in construction. If there is a continued increase of reusing already laid asphalt it means less crude oil is extracted from the ground. Crude oil is the main ingredient to creating bitumen; as it is a fossil fuel there are limiting supplies which could cause issues in the near future. This expresses how important the reuse of asphalt really is.

Fact: The Bitumen Asphalt paving industry is the largest consumer of recycled oil. Over 945 million gallons of recycled oil use in the USA annually.

Fact: An Asphalt road can be broken down on site and reused there and then. They would heat the broken-down asphalt paving and relay it as a new road.

Fact: BP claimed the earth has only 58 years left of extracting crude oil until the earth runs out.

CO2 Emissions of Asphalt construction (unit:kg)



- Raw Materials Production Phase
- Mixture Mixing Phase
- Transportation
- Laying Down Phase
- Compacting Phase

References

<https://www.cnn.com/2016/08/04/the-bitumen-industry-tackles-environmental-challenges.html> Date accessed : 12.02.20
<https://eapa.org/landfill-construction-in-asphalt> Date Accessed: 10.02.20
LCI Bitumen – Eurobitme, Philippe G Dewez, 2011. Date accessed: 10.02.20
<https://www.zacks.com/stock/news/287141/how-much-oil-is-left-in-the-earth> - Date Accessed: 13.02.20