INTRODUCTON

Production and usage of construction materials are responsible for 40% of the global warming phenomenon. As stated by the UN Intergovernmental Panel on Climatic Change (IPCC), the concentration of CO_2 in atmosphere will reach 550 ppm as earlier as 2050, causing an increase in the average temperature of the earth by 1.4–5.8 °C, a rise in sea level, extreme drought, wildfires, floods, and food shortages for hundreds of millions of people . Cement , Petro-chemical, Iron & steel manufacturing are the most industries, which mainly contribute to the increment of CO_2- emission. Thus, the modification in the processing of these industries to mitigate CO_2 emission and the invention of a new technology with high efficacy in the CO_2 separation are urgently required.

Among different construction materials, Portland cement (PC) has the highest global demand. As Portland cement is produced by calcining limestone/mar/chalk with clay at a temperature higher than 1400 °C, it is one of the main sources of greenhouse gas emissions (GHG), toxicities, and ozone depletion. Therefore, around 5–7% of global anthropogenic CO_2 emissions are associated with the cement industry every year. CO_2 emission per ton of produced cement using coal and oil-based fuel ranges between 900 and 1200 kg, categorized into two groups (1) CO_2 converted from carbon compounds of the raw material during the manufacturing process and (2) emitted CO_2 from combustion of fossil fuel to drive the production process. Therefore, increasing material efficiency is a key strategy to reduce the environmental impact and energy consumption of concrete. The use of replacement materials to reduce the environmental impacts of Portland cement is one of the solutions to achieve material efficiency. On the other hand, structural limitations and weaknesses to fire, termite, mould, moisture, and bacteria of materials such as wood-based construction materials have encouraged technology developers to think about other possibilities.

To respond to the above challenges, one solution is to use new types of materials that may have lower environmental impacts and better engineering performance such as MgO magnesium oxide based boards in the building industry. The results of those studies show that MgO board usage leads to lower environmental impact.

Studies show that MgO boards are an eco-friendly and high-energy performance construction materials for buildings, and they can even have CO_2 sequestration potential.

RAW MATERIAL

The main raw materials for production RMS boards are “ magnesium oxide powder”, Magnesium oxide have been employed in a wide variety of industrial applications such as the manufacture of refractories, crucible, cement, heating elements, animal food, vitamin & supplements, production of pharmaceuticals and fire retardants , etc.. and as in our industry for producing magnesium oxide based boards for construction and various building applications.

Magnesium oxide are derived from natural occurring magnesite ores, during the heat treatment of magnesite, producing different types of MgO (magnesia). The estimation of the carbon footprint from magnesite calcination is about 2.7 kg CO_2 eq/kg, undertaken by Chinese producers.

Magnesium boards vs Cement boards

The total CO_2 emission of concrete (cement boards) is estimated to be at least 750 kg/metric ton, more than 80% of which is emitted during the calcining process at 600 kg/metric ton. Whereas, magnesium boards CO_2 emission is estimated at only about 200 kg/ metric ton during the calcining process. Magnesium boards uses significantly lower calcination temperatures (700-800 °C) than cement (1450 °C). To produce 1 ton of MgO, 1.1 tons of CO_2 is emitted from the following reaction : $MgCO_3$ MgO + CO_2 Thus magnesium boards decreases its environmental impact.

MGO CO_2 FOOTPRINT

MgO construction material has a much lower CO_2 emission than comparable products like concrete (CaO), resulting into a smaller carbon footprint and usage of water.

MINING		EXTRACTING		SHIPPING	
MgO:	60 kg/t	MgO :	200 kg/t	MgO :	140 kg/t
CaO:	60 kg/t	CaO :	600 kg/t	CaO:	60 kg/t

PRODUCTION

Simplifying the production process of RMS -magnesium boards into 4 Steps as follows :

Step 1: Adding the mix of its main essential raw materials : Magnesium Oxide (50%), Magnesium Sulfate (25%), Perlite (10%), Wood Fibres (5%), Others.

Step 2: The matrix is combine in a measured mixing process forming into a “cement” like fluid paste which is then embedded with layers of alkali resistant glassfibre cloth in the continuous production line.

Step 3: A cylinder presses the paste to 30mm, in standard widths of 1220mm and lengths of between 2440–3000 mmm maximum.

Step 4: The boards are automatically place on a drying rack and into a curing room for 24 hours, taken out of its production mould and left for it’s 2nd stage natural curing for about 2 weeks. Once dried, the sheets are cut to size, process , pack and ready for shipment.

Trilite RMS board’s production is carbon-neutral and energy friendly. During the production, a much lower temperature is needed and this saves a lot of heating energy. Curing is achieve with minimum energy consumption and little emission of CO_2 than other comparable products (i.e : concrete / cement boards). CO_2 is high on the list of “greenhouse” effect that contributes to global warming phenomenon. The curing process captures carbon dioxide and unlike other comparable materials, out board contains no asbestos, formaldehyde, ammonia, silica or benzene. It is non-toxic, non-carcinogenic, VOC & TVOC, certified & tested as an “M1“ -emission classified building material. It contributes to a healthier indoor air quality and environment.

During the production and processing of our boards, waste such as rejects, slurry, polishing, and cut residues are recycled back (allowable limits) into the production mix after they are separated, re-grinded.

While the main energy sources of the production are natural gas, electricity and oilbased fuels. The CO_2 emission of our RMS boards produced by natural gas is 18% less than other MgO board factories produced by coal. The CO_2 emission of the board 37.3 (kg CO_2 eq/m2), which is at least 22% less than the CO_2 emission of cement/concrete-based scenarios (105 kg CO2 eq/m2 for tilt-up and 48 kg CO_2 eq/m2 for ICF). The CO_2 emission of wooden-based scenarios ranges between 19.12 and 28.7 (kg CO_2 eq/m2) which is lower than MgO panels. However, there are physical and technical limitations for wooden-based wall products that encourage their replacement with MgO panels. An analysis shows that adding 1 kg MgO to the MgO boards leads to 1.4 kg increase in CO_2 emissions. Additionally, 1kWh energy saving in the production process provides 1 kg less CO_2 emissions.

END OF LIFE

At the end of it’s life, the boards are re-usable and completely recyclable product classified as nutritional waste. Leftover material can be ground up and sprinkled into the soil to act as a nutrient, or added to new cement mixtures or used as a soil amendment. It is not made of any toxic materials and is considered landfill friendly. It’s sawdust may be safely buried in landfills without contamination or environmental damage to the land, streams or bodies of water.

SUSTAINABILITY

Magnesium is the very base of RMS- magnesium silicate board. It is present in large quantities on our planet and is consider the 8th most abundant natural mineral on earth and it is the 3rd most common element in seawater. In fact, with a plentiful supply, we have enough magnesium to last for centuries. It is estimated that 6-8% of the earth’s crust is magnesite, the mining of magnesite is conducted on the surface and requires no chemicals and the process of breaking chunks from the mountain.

GLOBAL WARMING POTENTIAL

Trilite RMS - magnesium boards have no biogenic carbon storage. Our boards are a more sustainable alternative with full cycle of life uses. It is completely safe being made from minerals required for the health of people, plants and our environment. They also have low embedded energy and absorb CO_2 from the air.