The physical process of separating australian industrial mixtures

Iron (FE) is a metallic element which makes up roughly 5% of the earth's crust. Iron is mined vastly throughout Australia in many different areas including Tasmania, South Australia, Western Australia and Victoria. Australia is one of the world's major iron ore producers, producing 393. 9 Mt in 2009 alone, valued at roughly $30 billion. Iron serves many different purposes but it main use is to produce steel, steel is known to be the most useful metal being used 20 times more than any other metals found in the earth's crust, therefore making the demand for fine quality iron ore extremely high. Iron ore is any form of rock in which iron can be economically extracted from.

The iron within the rock comes in two main forms of iron oxides: magnetite and hematite. The three primary sources iron ores found within the earth's crust are banded iron formations, magmatic magnetite ore deposits and hematite ore. The hematite and magnetite is physically extracted from the iron ore by using a fairly straightforward process of coarse crushing, fine crushing, classification, dry magnetic separating, floatation, thickening then drying. This process is known as dry magnetic separation.

Dry magnetic separation takes place once the iron ore had been extracted from the mine and delivered to the processing plant. Firstly the raw iron ore is put through a vibrating feeder which will feed iron ores into a jaw crusher which crushes the coarse iron ore into a finer form of iron ore sand. The iron ore sand is then fed through a secondary crusher known as a ball mill, the ball mill grinds the iron ore sand into the finest powder sized iron ore particles.

The next stage of the separation process is classification. The classification process takes place in a spiral classifier which acknowledges that solid

particles of various sizes have different precipitation rates in liquid therefore allowing the machine to wash and grade the ore mixture. After the mixture has been washed and graded the mixture is passed through a magnetic separator. The magnetic separator separates the magnetic material from the nonmagnetic components of the mixture. Once the magnetic components have been separated they’re passed through a flotation machine.

The flotation machine is the only step throughout this procedure which contains a chemical method of separation. When the magnetic materials are fed through the flotation machine various chemical substances are added in order to separate the iron from the other magnetic matter. Once passed through a thickener the final product is put into a dryer gaining a form of dry pure iron.

The issues associated with dry magnetic separation is a concerning amounts the mining field in not just Australia but all over the world. The process of separating iron from its ore tends to expel a large amount of waste therefore creating problems for the mining companies themselves as well as the environment. One of the most concerning wastes from a dry magnetic separation plant tends to be the disposal of wastewater used in the separation process. Waste water has the potential to contaminate surrounding bodies of water destroying local ecosystems. Another waste issue associated with the processing of iron ore is taconite.

Taconite is a low grade form of iron ore containing roughly around 27% pure iron amongst its ore. The issues with taconite are that the fibrous minerals found in its dust have been proven to cause various types of lung conditions being harmful to both the surrounding community as well as the workers

amongst the processing plants. Another waste issue associated with the separation of iron from its ore is the vast amount of disposed tailings. Tailings are various materials left over after the process of separating valuable metals from an ore.

The issues with tailings is that they often contain elements and compounds, that are uncovered through mining and its processing, that are not usually part of the local ecological systems. This means that the substances found in tailings have the potential to have a large negative impact on the environment.

First hand investigation- extracting iron from a match head from this first hand investigation the student shall be learning about the extraction of iron from its ore. But instead of extracting iron from ore the students shall be extracting iron from matches. The students will undergo this practical in group of 3 due to the nature of the experiment the three students will need to be fully engaged and approach the experiment with a good knowledge of how the investigation will take place.