Initial Design Solution: Pre Separation of High Alloy Steel at Scapyard

Our first initial concept idea is to separate the steel from the other materials of the car right at the scrap yard. This pre separation technique would take place before the cars went to the crushing machine in the scrap yards. By using manual labor to separate the steel body and doors of the car from the other materials such as the rubber, glass, plastic and other inner body parts, this would save money in the future by not having to using heating or melting techniques. The separation of alloyed steel from the scrap would take place as soon as the car was received at the scrap yard. It would speed up the process if the recycled cars where brought back to the plants where they were made so that the car manufactures know exactly how the car was put together. By scraping of the metal from the body and the hood and eliminating the other materials, the high alloy steel would be left remaining. The scrap cycle management would however take more time to separate this metal from the car’s body. The scrap metal could then directly be transferred to the steel plants to be processed down as to not affect the chemistry of the high alloy steel. By avoiding off-chemistry heat, the steel would still contain all of its high qualities without having to use chemicals or large amount of heat to diminish the steel’s chemistry. This would save money by not having as large of energy costs and machine production costs. The material usage would be minimal because outside resources, such as heat, chemicals, melting plants and others would not be needed to separate the steel. The energy usage would be very efficient. The only major energy usage would be the required manual labor to separate the parts at the scrap yards. This problem could be solved by producing machines that could actual do this manual labor for the scrap yard plants. These machines could rip off the doors and scape the high alloy steel off of the body of the car. Overall, this idea would be a start to the process of recycling the high alloy steel. We feel this idea would be best combined with one of our other ideas as to pre separate the scrap metal off of the car, and then use another process to more efficiently recycle the steel. Maybe this could actually be sent back to the original manufacture to speed up the process by having the company know how to put it together. This is our first concept idea.

Initial Design Solution: Mass Spectrometry

The second initial concept idea is the use of mass spectrometry to separate the different compounds and elements within the steel during the recycling process.
Essentially this process works by shooting things through a magnetic field of known strength, which will cause it to curve a certain radius based on its charge to mass ratio. Because the magnetic field and radius are known, so these values can be used to determine the charge to mass ratio. The plan is to set up a mass spectrometer with holes at the end of the magnetic field at locations where the elements and compounds that compose the steel will end up based on their charge to mass ratio. Thus they can be separated from each other. This idea would work well at separating the steel from alloy, as it does so based on the chemical properties of each of these things. It would improve the separation portion of the scrap cycle. However, it would add some processes such as separating the metal in the first place and determining where the metal compounds should end up based on the multitude of different charge to mass ratios present. As for avoiding off chemistry steel, this idea would help separate the different alloys, but it does not have much to do with the actual steel making process. Mass spectrometry would consume a good amount of electricity to create the magnetic field, ionize/separate the compounds from each other, and shoot them through the magnetic field. Its material usage would be high as well, for essentially the same reasons mentioned above with the intricacies of the process.

**Initial Design Solution: Gravity Melting**

Our third idea involves using melting points in order to separate the different metals which compose the alloy. Essentially, shreds of metals will be put in an airtight mixer that will heat to certain temperatures based on what metal is trying to be extracted. All of the metal will initially sit on a screen so that when the specific metal melts, it passes through the screen by force of gravity. The mixer will gradually heat until all the metal is melted away at which time it will be ready for another batch. There will be a tunnel for the liquid metal to flow down into to enter the original process. This process effectively separates alloyed steel from scrap in that scrap will either burn away or melt at a separate point than the metals that we are separating, but it adds the need for a lot of energy and new machines.
in order to power the process. The cycle in general will probably take more time because of the extremely hot temperatures needed to reach in order to melt metals like manganese. A huge amount of energy would be required as well as a lot of material. In terms of off-chemistry heat, the mixer would be able to effectively melt the specific metals individually which would maintain the purity of the each element.

**Initial Design Solution: Pig Iron**

Pig iron would be worked into steel. In this process, pig iron is melted and a strong current of air is directed over it while it is being stirred or agitated. This causes the dissolved impurities (such as silicon) to be thoroughly oxidized. More slag formers are introduced and more oxygen is blown into the bath, burning out impurities such as silicon, sulfur, phosphorus, aluminium, manganese, and calcium, and removing their oxides to the slag.

Then in a Electric Arc furnace, or basic oxygen furnace Pig Iron is blasted with slag in order to create a higher quality steel.