

Ethics Report: From Cars and Phones to Cobalt
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Significance of Ethics in Engineering:

The nature of engineering is to design, to innovate, and to create. With such a variable scope of invention, it is all too easy to set aside human decency for the sake of progress and profits. From privacy violations and harmful energy efficiency to malignant artificial intelligence or intellectual property violations, there are all too many dark sides to engineering that can appear. Sometimes the ethical choice comes down to the strength of the individual's moral agency and it rests on the shoulders of every engineer to uphold morality.

Introducing the Issue:

In 2006, Tesla unveiled the Tesla Roadster. Since then, Tesla has grown into one of the largest car companies in the world and certainly the most ubiquitous producer of electric cars. In the following years, companies like Volkswagen and General Motors as well as foreign companies, primarily BYD (a Chinese automotive company), developed additional electric vehicles. In 2023, BYD, followed by Tesla, Volkswagen, and General Motors, were the four largest electric vehicle producers globally. In fact, in 2023 around 14 million vehicles were sold and Bloomberg predicts around 17 million vehicles will be sold in 2024. What was the common factor amidst this variety of vehicles? Batteries. Lots and lots of batteries. Of course, batteries are not only used in electric vehicles; technology companies have dire need for them too, with a dominant example being Apple. In 2023 Apple sold 151 million iPhones. Of course, every iPhone has a battery.

But what gives? How bad can seemingly innocuous batteries be? The answer is complicated. In previous years, a dominant type of battery were lithium-ion batteries where a key component was cobalt. There are newer methods to produce iron-phosphate batteries but it has been seen that, while these batteries are not reliant on cobalt, their capacity and efficiency is lower than lithium-ion variants.

The core issue with batteries resides in the usage of cobalt. The largest producer of cobalt is the Republic of Congo and, unfortunately, they are well known for scarce child-safety laws and abusive child labor. Some 30% of cobalt produced there is done under the guise of 'artisanal mines,' a well-known cover for child labor. While companies attempt to use 'cleanly sourced' cobalt, supply chains make it difficult to know the true origin of the cobalt being used.

In 2021, BYD declared that they would transition to iron-phosphate batteries, but this does nothing to reconcile the millions of cobalt-dependent batteries they had already seen made. Tesla only promised to adopt iron-phosphate batteries in 2023 and even now, only half of the cars they produce use these cleaner batteries. Apple will not transition to iron-phosphate batteries at all and has only promised to use solely recycled cobalt by the year 2025.

The Horns of the Dilemma:

There are three main dilemmas that arise from this issue: ethical versus practical consideration, sustainability versus human rights, and short-term gain versus long-term ethics. With ethical and practical

considerations, it is important to note the impact of increasing demand; it is predicted 17 million electric vehicles will be sold in 2024, up 4 million in count from 2023. The same trend is seen with Apple. This demand increase has to be weighed against the ethical implications of sourcing cobalt and the severe human rights violations surrounding it. Moving onto sustainability versus human rights, where the desire for electric vehicles as an environmentally-friendly solution to gas-powered cars is strong. At the same time though, this desire directly fuels supply chains powered by child labor, abusive working conditions, and human rights violations in third-world countries. How can we push for green solutions and protect the rights of abused workers? Finally, we look at short-term gains versus long-term ethics. The immediacy of the demand the market sees applies pressure to companies like Tesla, BYD, Volkswagen, and General Motors to produce. However, did this burst supersede the need for more ethical battery solutions? Only now do we see the glimpse of innovations but did it happen too late?

The Impacts:

There are three main categories of impacts we see from 'the horns of the issue,' being environmental impacts, human rights impacts, and economic impacts.

From the environmental perspective, producing electric vehicles is a massive positive in transitioning towards a greener future. Electric vehicles, despite the production efforts, are greener than gas vehicles, even when considering that most electricity comes from gas or coal plants. A greener future with electric cars is a very positive impact of this issue.

From the human rights perspective, nearly 25,000 children are working in cobalt mines in The Republic of Congo. Toxic fallout causes sores, burns, and cancer in those with close exposure to cobalt. Not only that, in many cobalt mines, there is uranium present, causing high levels of radiation. Furthermore, children working in cobalt mines are actually drugged to suppress hunger. The worst part is that these jobs are actually desirable in The Republic of Congo; mining pays somewhat decently and many who are miners desperately wish to hold onto their jobs. Child exposure to these harsh, deadly conditions is a terrible consequence to mining, with the minor upside being the somewhat desirable job position for adults because of the pay.

From the economics perspective, electric vehicles are only increasing in demand which drives high profits in the sector. This creates more jobs in these industries which in turn allows for more innovation. Not only that, but the high profits from cobalt mining drove Chinese companies to acquire stakes in modern, powerful cobalt mines in The Republic of Congo. These are known to be cleaner and stir up less human rights violations, with the downside of destroying communities to make way for the mines. The increase in profits are a good consequence of the increase in demand. The downsides are the human rights violations that occur from increased battery demand, even accounting for the more modern, Chinese factories.

Relating Incidents:

In recent years, interviewers ventured into The Republic of Congo to explore the real condition of cobalt mines; what they found was horrifying. Amidst a sea of shocking discoveries, the standout one was that the children that are forced to mine cobalt are drugged and sedated. This practice helps abate the hunger

these children feel *because most children cannot remember the last time they had a meal*. I don't like electric cars, even if they are good for the environment, and that isn't helped by this story. I felt physically ill thinking about these conditions.

Minimizing Approaches:

There are plenty of approaches that can, and actually are, being taken to combat the negative aspects of cobalt demand from batteries. Firstly, innovations in battery technology to replace cobalt would be fantastic. Iron-phosphate batteries have already been created and some companies, BYD and Tesla namely, have taken up integrating them. However, their efficiency and capacity are lower than cobalt-dependent batteries, so more innovation needs to be done to block cobalt-dependant batteries entirely. REcycling programs are an excellent way to combat dead batteries contaminating the environment. Many companies already are able to recycle up to 95% of battery components now so improving this figure could be a key step in sustainability. The last innovation could come in the form of supply chain transparency to allow companies to better see the origin of their cobalt and international policies enforcing these supply chains alongside international legislation in The Republic of Congo could clamp down on this.

Resources:

<https://www.newscentermaine.com/article/news/special-reports/maines-changing-climate/electric-vehicle-ev-cobalt-mining-lithium-ion-battery-ethics/97-fb4c9993-6d5d-4809-a192-414faa12fecf#:~:text=The%20issue%20is%20that%2C%20according,labor%20and%20hazardous%20working%20conditions>. - Website on Cobalt in battery usage.

<https://about.bnef.com/blog/electrified-transport-market-outlook-4q-2023-growth-ahead/#:~:text=With%203.7%20million%20units%20sold,and%2016.7%20million%20in%202024>. - Website on projected electric vehicle sales.

<https://www.demandsage.com/iphone-user-statistics/#:~:text=Apple%20has%20sold%20151.3%20million%20iPhone%20units%20globally%20in%202023>. - Website for figures on Apple phone sales.

<https://coltura.org/evbatteries/#:~:text=If%20EV%20batteries%20continue%20to,from%20disposal%20of%20used%20batteries>. - Website for electric vehicles battery types.

<https://www.fool.com/research/largest-ev-companies/> - Website for largest electric vehicle makers.

<https://www.cbsnews.com/news/the-toll-of-the-cobalt-mining-industry-congo/> - Cobalt mining info.

<https://www.cecc.gov/events/hearings/from-cobalt-to-cars-how-china-exploits-child-and-forced-labor-in-the-congo#:~:text=Mining%20of%20cobalt%20is%20linked,cobalt%20mines%20in%20the%20DRC>. - Cobalt mining info.

<https://www.newyorker.com/magazine/2021/05/31/the-dark-side-of-congos-cobalt-rush> - interviewers exploration into The Republic of Congo.