



Umicore at the Core Event in Poland

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Umicore Battery Materials – Mobility electrification in full swing

Ralph Kiessling

Executive Vice-President E&ST and upcoming Executive Vice-President

Thank you very much, Mathias, for the introduction.

And good afternoon, ladies and gentlemen, and welcome also to everybody who is joining us online.

At the Capital Markets Day in June last year, we provided our view about the growth, about the exponential acceleration of the electrification of mobility.

Now, one and a half years later, we can confirm that the electrification is in full swing. And moreover, that Umicore has clearly a head start for a leading position with a strong customer portfolio and of course, a strong technology portfolio about which we will talk more in the afternoon and also tomorrow morning.

So Katharina and I will now guide you through how the key drivers are further accelerating this electrification, but how the electrification will be diversified and tailored to the different requirements in the different EV segments, different applications, but also regional preferences and requirements, which will ask for a local-for-local approach, local-for-local solution in terms of technology, in terms of manufacturing footprint and also in terms of value and supply chain, and how Umicore's strategy is exactly addressing these requirements.

Even though we see currently certain signals that this tremendous growth of electrification short term may slow a little bit down and of course, there's volatility in the market, but we are still talking about 40% growth this year for the first nine months, the long-term key drivers are intact.

And here are a few. We talk about the strong regulatory push. While a lot of the initiatives have been under discussion still last year in 2022, they are now confirmed.

The internal combustion engine sales ban in the European Union with a few exemptions. In North America, a once-in-a-lifetime subsidy program to really support the customer and the battery industry in both areas is a very strong localization, regionalization push. And we see these measures also complemented by the introduction of zero emission vehicle policies even in 10 states now in the US, and Canada is also implementing very strong subsidy, very strong grant program to attract the battery industry in North America.

So this regulatory push will further drive the electrification. What we see and what is critical, of course, for the customer, for the consumer is the cost of the purchase and for operating vehicle. The total cost of ownership between EVs (electric vehicles) and gasoline and diesel engine cars has clearly progressed and we see parity already among many segments and many models. And we expect that overall a price parity will be achieved around 2026. Of course, with the additional incentives like we see in the policy in North America with the IRA, this parity will be further pulled ahead.

Charging infrastructure. This always has been seen as limiting to the growth of electrification. But when we look at the figures, it looks actually different. It has been very substantially grown with rates of growth about 50% in line with the EV growth and with all the initiatives in place, we expect it also to grow further in line with the electrification.

Europe, North America is still behind, especially China, who is a front runner, but now slowly but gradually are catching up.

And last but not least, it's the electric vehicle model portfolio. We see really the offerings of models are currently exploding and it's not only limited to the premium segment, but also in the mass and in the entry segment. And of course pushed by the ambition of many OEMs to have at least 50% of their fleets electrified by 2030.

So we expect that let's say the offerings and models will more than double until 2030 and we see exactly the adverse effect for gasoline and diesel engines current offerings is about 1200. This is what you see for 2030 for electric vehicles and will further decline with an inflection point expected around 2026. So in a similar time range, what we see also for the price parity.

So all these key drivers are intact and further pushing the electrification. We forecast that by 2030 about 40% of the production of light duty vehicles will be for battery electric vehicles with growth rates of about 20%, which of course will be not absolutely linear, but in average, this growth.

And it's a fair assumption that this trend will continue on the back of the strong regulatory requirements to ban internal combustion engines in by 2035. We have in Europe, as I said already in several states in North America as well.

So we expect here the rate being clearly above 50%. This drives, of course, tremendously also the demand for cathode active materials - cathode active materials are the most valuable component in a battery

accounting for about 50% of the value of the price of a battery reconfirming that Umicore is operating in a very critical segment of electrification.

By 2030, we see a demand of about three terawatt hours only for light duty vehicle, mostly passenger cars application. If you include emerging applications like for medium and heavy duty vehicles and others, we talk about four terawatt hours in 2030 and more.

Most of the growth is seen in North America and in Europe. And if we include China, this will be around 90% of the worldwide demand. These are, of course, figures from a global view. But as I said in the beginning, they are different regionally and also application and segmental requirements for the electrification.

And this will now be explained more in detail by Katharina.

Umicore Battery Materials – Mobility electrification in full swing

Katharina Grabrucker

Strategy Director Umicore Battery Materials

This market development is without any doubt offering a huge growth potential for battery material makers such as Umicore.

But in order to leverage this potential, it's really key to understand how the market ticks and to understand the different needs of our customers, cell makers and OEMs and also the end users. And this is also what I will show you in the next couple of minutes.

It's not a one size fits all. There are diverse market needs and it's really important to meet these needs. And we, as Umicore, are more than well positioned to meet these needs with our broad and diverse product portfolio.

As Ralph has already shown in the previous section, the number of BEV models is increasing with OEMs almost every week announcing a new model. And it's really

important to understand that as the preferences of the consumers are very diverse, also these models are very different. And this is really key to keep in mind because this diversity directly translates into different battery requirements and also into different CAM technologies.

And here I want to simplify this discussion. I want to introduce a segmentation of this market. And you will see the segmentation more often throughout the presentations as my colleagues will refer to it. And this is something that might be quite familiar with many of you because it's used across the industry and it's based on the IHS regional sales categorization.

So on the one hand of the spectrum, we have the entry segment. And the entry segment, it's usually small cars, both from a size of the vehicle, but also from the battery size. And the cars are usually used more for short distances, for commutes and also in cities.

If you go to the other side of the spectrum, you have the premium segment. And in the premium segment, the car is usually more than just a simple means of transportation. And it's often also a lifestyle product. Performance is key and usually it's also a bit on the upper range of the price range.

And in the middle, we have the broad mass segment. And this is really cars, medium size, medium price point that suits the majority of the population and really cater everyday needs. And as you can see also in the figures on the slide, when looking at today's segmentation and the split of the different segments, it's quite even around one third of the market.

But we see with the growing electrification, especially in North America and Europe, where especially the mass and premium segment is important, we see an increase in the share of the mass and premium segments, around 50% for mass and 30% for the premium segment. I already hinted upon these different requirements before, but when we look at the different requirements of a battery, we see that there are some similarities across the segments, but also some differences.

Coming to safety and stability first. And I think here we can all agree that this is one of the key requirements for all of the segments, no matter whether it's entry, mass or premium. It's really of utmost importance for all the OEMs that there is no thermal runaway, that the car is safe and reliable.

So that's, I would say, non-negotiable prerequisite for all of the technologies on the market. It's different if you come to the performance. And that's mainly energy density and also charge rate. And I believe if I would ask here in the room, if you don't have an electrical vehicle, range would be probably the number one answer why you don't have an electrical vehicle yet.

So it's really important for most of the consumers, especially when switching from a combustion engine to an electrical vehicle, that they don't reduce the comfort, that they don't have to stop every 100 km to charge the car, and if they need to do so, that at least this is fast. And this is particularly important for the mass and premium segment. Of course, also in the entry segment, they want to have some range, but it's just of lower priority.

And looking now at the other side of the coin, the cost. Affordability of electrical vehicles is definitely key. And I mean, when looking at the adoption rate, this will be one of the key drivers to bring the cost of a battery down and will lead to increasing electrification. So definitely everyone is working on that.

But nevertheless, there are different preferences. And the price sensitivity, the cost sensitivity, is in the entry market much higher than in the mass and especially in the premium market. But of course, it's always a tradeoff.

And lastly, looking at recyclability, I think here it's quite difficult to say it's like this for the entry segment and like that for the premium segment. But we see quite some regional differences.

In North America and Europe, where there are also already or in the future regulations in place that define the recyclable content of a battery, this will be much more important. And in these markets, we also see more mass and premium vehicles than in other regions.

While when we look in other regions, very recyclable content is not of such an importance. And this is mainly in regions like China, where there is a large entry segment. We believe that recyclability is of lower importance in the entry segment.

So summing it up, entry segment, it's really all about cost and they're also compromised on range and performance as possible.

If you go to the other side of the segmentation here to the premium segment, it's really about performance. High energy density range and fast charging is key. And the mass segment is somewhere in between. So it's really about balancing performance and cost.

So I talk now a lot about different market segments and about different customer preferences. But you might ask, OK, what does this have to do with a cathode active material maker such as Umicore? And here it's really important to again keep in mind that CAM material is one of the key performance, but also cost drivers, of a battery. So it's up to us, among others, to really meet all the requirements that you have seen on the previous slides.

And I will guide you now a bit through the slides. It's a bit complex, sorry for that already, but you will see it also more often throughout the presentation. It's important that we go through it step by step.

On the one hand, we have the entry, mass and premium segments. So the segmentation on the other axis, it's the timeline. So we will talk about short, midterm and also next gen technologies.

Today we are mainly looking at liquid lithium ion batteries as battery technologies. And when we look at the technologies, the CAM technologies that are available in the market, it's mainly three. Of course, there are some smaller ones, but these are the key ones.

And that's high nickel NMC, which is mainly catering the mass, the premium and the mass market. It's LFP, which is catering the entry and the mass market, and medium nickel NMC, which is catering mass market, but also parts of the other segments.

If you look a bit more in the future, so in the next couple of years, there are of course more technologies in the pipeline and will come into the market. On the one hand, more for the premium market, we have high-nickel NMC with even higher nickel content, so 90 plus. But there are also new technologies like next-generation high-voltage mid nickel NMC, as well as LFMP, which is an advanced LFP with manganese, and also NMX, so no cobalt NMC, as well as HLM, so high-lithium manganese technologies.

And these are technologies that are mainly catering the needs of the entry segment and also the mass segment, which have a higher energy density than LFP, but at a quite similar price point.

In the long term, we will see new battery technologies coming into the market and being established. And Mattias already mentioned them, it's mainly solid-state, all-solid-state batteries, semi-solid-state batteries, which are more for the premium than mass segment, as well as sodium-ion batteries, which are more catering the needs of the entry segment. And of course, also, car manufacture need to provide cathode active material for these batteries. And it's high nickel, medium nickel for the solid-state batteries, sodium-ion cathode active material for the sodium-ion batteries.

And then there is also DRX, disordered rock salt, which can be used in liquid lithium-ion batteries. And I will not go into more detail here now because we have presentations of GS and Stephane later today who will provide all the information you will need on that.

But what is important to already mention here is that when we look at the portfolio that we as Umicore have, that we are really catering the needs of the whole market, from premium to mass to entry segment, and then also in short, mid and long term technologies.

So how does this translate into the chem demand? And referring again back to the three terawatt hours of demand that Ralph showed before in 2030, we estimate that around half of the market will be for technologies that are catering the needs of the entry in the mass segment. So LFP and HLM, while the other half of the market will be more NMC-like chemistries, like for the premium and for the mass segment. So this gives us as Umicore not having LFP in our portfolio, a market, an adressable market of around 65 to 70%.

But what is important is to really keep in mind also the differences I already mentioned before across the different regions and the different preferences of the consumers. So when we look at Europe and North America, you see that range anxiety is very important or a huge thing. Driving distances are much longer, recyclability is more important. And there is a general preference for more the mass and the premium segment vehicles. And that's why we also estimate that the demand for NMC and HLM is much higher compared to a global context around 80, 85, 90% in 2030.

And this is very different when we look at the other regions, especially China. I mean, we all know that LFP has a huge market share already there today. And we don't see any reason to believe that this will be different by 2030. So here we definitely see that LFP will be the key technology in 2030, mainly for the entry segment, which is much larger in China than in the other regions.

And the other technologies will also play quite some importance as you can see here, but might only take half of the market. And for the rest of the world, it's a bit of a mixed picture. So different technologies taking their share in the market.

So I hope you can see now that it's really important to always keep in mind the different market needs and how this translates into battery technologies or battery requirements and also cathode active material technologies. And that we as Umicore are really well positioned to meet these different requirements.

And with this, I will hand over again to Ralph, who will show that also a local production footprint is the key for success.

Ralph Kiessling, Executive Vice-President Energy & Surface Technologies and upcoming Executive Vice-President

Thank you very much, Katharina. As you already pointed out, electrification has different regional requirements for the cathode active materials. And exactly the same is valid for the value chains. While the electrification, the cathode active material demand has a global reach, it's really regionalizing and will be decided on a regional, on a local level. And this is for three major regions.

First of all, we talked already about the regulatory pressure with everything being put in place. This is pushing really to regionalize the value chain. And this is not only on the downstream side for the cathode active materials, but also more and more on the upstream side on the upstream processing. Of course, what is key are robust supply chains. OEMs are reiterating with us that they don't want to have a second chip crisis. So they are really pushing to massively reduce the cluster risk and the dependency on a single supplier from a single region only. And what is of course critical is cost and the CO2 footprint, and the CO2 footprint being the intrinsic driver of the electrification.

So intercontinental transportation adds to logistics costs, adds to pipeline and working capital requirements, reduces planning predictability and supply reliability. So the OEMs really pushing for localization, and this is very critical for the cathode active material industry. And Umicore is exactly addressing this requirement with a global, but a local for local footprint. So we are and will be present to serve our customers locally in all major regions.

We have just, as you know, broken ground for our side in Loyalist in Canada to serve in the North American market with the gigafactory. We are extending our European footprint and have decided, and recently announced, that Nysa is the launching site for IONWAY, our joint venture with PowerCo, built on the hub in Nysa, which you can witness tomorrow morning.

And we are also reinforcing our Asian footprint by introducing the latest technology footprint here and have Korea as a hub with regional flexibility. All the different sides, and Mathias mentioned it already, will be equipped or are equipped already to produce the current, the near-term and also the longer-term technology with a flexible, with a modular and with a cost efficient manufacturing setup. And Michiel will tell us more details about it tomorrow morning.

And this brings me to the key takeaways. So we confirm that the electrification mega trends, the key elements are fully intact, leading to a massive growth and development for the cathodic active material market in all regions. My colleagues will show you in the afternoon today and tomorrow morning that we have a future-proof innovation, a future-proof technology set-up to extend our leading position.

We have a broad technology portfolio and clear roadmaps to serve the market and the requirements in all segments of the electrification. And as I just mentioned, we can produce all the requirements locally with a unique manufacturing set-up and we invite you tomorrow morning to witness it at us during a site tour in Nysa.

Thank you very much.

And with that, I would like to invite Frank and Geert on the stage to give us more insights about Umicore's future proof innovation approach.