Umicore at the Core Event in Poland

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Speakers:
Caroline Kerremans
Mathias Miedreich
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Stephan Jannis
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Stephane Levasseur
Dariusz Jurczak

Q&A Session

Mazahir Mammadli, Redburn Atlantic
I wanted to ask a question about the CAPEX density. So if you compare what you're seeing for Loyalist versus what you incurred 2017, 2018 in China and what you incurred in Nysa, X inflation and including inflation, what is the trend? How can you elaborate on that? Thank you.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Let me say a few words on CAPEX density. It's probably together with OPEX, my main KPI which I'm responsible for.
So we are spending a lot of time on understanding and see how we can improve. Nysa is an improvement on our CAPEX density for our operations here. And why is it?
Because when you are building a new site, what you do is you leverage scale and you leverage the latest process technology. So our individual processes that we use, so firing, washing, wet milling, et cetera, et cetera, have a higher throughput than the classic operation that we have in China and Korea.
So with new investments, you are able to leverage much more these new process technologies. So that's a big benefit of that. So we are confident that Nysa is substantially more efficient from that point of view and the same will go for Loyalist. So we continue to improve what we're doing and that's why we're spending so much time and efforts with our process technology, with CAPEX procurement to understand what is the latest equipment, the best equipment, how far can we upscale? And the upscaling is an art in itself.
You can't just say I buy something that's two times as big because then my colleagues from Applied Technology and R&D said you're damaging the particles. It's not as simple, just making it bigger. You need to do a lot of work on validating these equipment as well.
So this is where we spend a lot of time. We're all spending time with our R&D colleagues. We do a lot of computerized modeling, for instance, for our ovens to understand what is the best behavior.
And we know that in Nysa and in Loyalist, we have the highest throughputs in the industry. So we're very confident on our competitive nature of the future operations.

Mathias Miedreich, CEO
Maybe could you explain one concrete example which I think is a great one, is the oven length in itself?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, I mean, most, if you look at CAPEX, if you look at OPEX and firing, is the most important step, the most expensive step. So we focused first our efforts on seeing how we can improve the firing. And that, I think we also explained it a little bit at last year's CMD.
We have ovens that have a much higher capacity because we're making them bigger, we're making them longer, we're making them wider. So the amount of cathode active material going into the ovens is substantially higher. We run it with much higher throughputs as well.
But we're also doing a lot of work in our operations in Korea and China where we understand, can we further kind of squeeze some throughput out by again doing this modular. Can we further improve the sintering behavior by playing with the temperature profile in the ovens as well, to actually increase those throughputs?
So this is a key lever for us to reduce our cost but also reduce our energy density. So higher throughput and an energy intensive process actually drops your energy bottom quite well.

Mathias Miedreich, CEO
And another important thing that I wanted to mention and that you will hopefully as well see, when you have a monolithic sequential process and you have installed it once, it is there and it's the CAPEX that you have spent and you have limited opportunities for throughput improvement.
One big advantage of the modular approach is also that you only have to change several things, smaller modules and you can potentially dramatically improve the throughput if you remove bottlenecks out of that, which you cannot do in a monolithic approach.
And that's what the team is doing day by day, even here in Nysa again, challenging the set-up that we have decided in 2018 and seeing which further improvements in this also rooting of the materials, what they hit first and second, what is the flow of the material in the plants, that will further then increase or decrease the CAPEX density even without doing anything on CAPEX. It's just increasing the throughput with all the learnings that we put in place.
But I think overall, I understand that the best thing that we should say, okay, the CAPEX density in Nysa is X percent lower than in Korea, but that's very difficult to say because there is not a kind of average CAPEX density. Each incremental installment has a different setup. We talk about Greenfield and Brownfield like yesterday. We talk about what is the capacity of the oven. So I think it's very difficult to make such a number.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, it is. But as I said, I think you mentioned it yesterday as well.
The other big benefit that we have is when we have Nysa, we add additional capacity, we can add it precisely per module rather than, okay, we install a new line. And that really drives a higher efficiency as well.
So the modular concept helps us to just add modules where we need it rather than, okay, you add a full line. And I think that's quite beneficial for us. High utilization of these individual blocks, so the post treatment utilization, the pre-treatment, and the firing, you can only get when you decouple it.
I mean, otherwise you have a linear design and you always design it with a bottleneck in mind, which is the firing in most of the cases as well. So high utilization is something that really is important in our industry.

Mazahir Mammadli, Redburn Atlantic
Thank you.
And if we think three to five years into the future when you have all these capacities up and running, maintenance CAPEX, what would you say the main components of it are? What is the expected magnitude of it per year?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Difficult to quote, I think, these numbers here. What I can say is that the initial phase, it's covered by the way we procure assets. So they often come with a guarantee and we procure quite often the maintenance for the first two years, for instance, with our procurement contracts as well. And then we're doing a lot of work based on the maintenance for instance that we spend in Korea and China on those ovens to see, okay, how can we do this different and more intelligent?
I mean, the classic approach of maintenance to say every half year we pull it apart and we assemble it together as well. And we want to move away from that in Nysa by analyzing the key elements of this. We do a lot of vibration control, for instance, to understand if the motors are within the operating band as well. So we're using some classic, I would almost say classical TPM technologies to see how we can further reduce our maintenance spend.
But the kits that we buy is very robust. Again, it's been running similar, have been running for 25 years in Korea and that's quite important to understand. Some of the materials that we're using like cobalt that we add is super abrasive. So if you buy standard kit and you don't think around the coating of the, for instance, the vessels, you will run into problems within a half year.
So we have got a lot of expertise and understand how to buy equipment which lasts for a relatively long time as well.

Dariusz Jurczak, Managing Director, Umicore Battery Materials Poland Also, as we are buying the new equipment, we are making the big precaution of the TCO. So we are not just buying equipment itself. We are also looking at the one-time investments but also we are looking very on the long term, what will be the OPEX cost?
So typical examples can be the pressure systems. So every time we are making the leverage, what will be the final cost if you look for the investment and also operational cost later on. So very precaution and then what was mentioned, a lot of predictive tools, the mobility.
So every time when we are choosing the equipment itself, we are also looking ahead of time to make sure that there's a proper validation and also a lot of automation. So we are looking from the standpoint of also use the equipment control system, the SCADA system. So those system which is usually coming with the equipment, we also want to highly utilize. So they're putting a lot of analytics. So this is a very crucial to make sure that we are not spending too much on the maintenance later on.

Mazahir Mammadli, Redburn Atlantic
Very helpful, thank you.

Tristan Lamotte, Deutsche Bank
Two questions please.
I was wondering first if you could compare your production process that you described to LFP and explain what makes the LFP process easier to do and therefore more

commoditized. Are there more process steps in your process, and what are they? And is a Greenfield plant cheaper for LFP?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, I've not focused on LFP at all. So I won't be able to answer that question.

Mathias Miedreich, CEO
Yeah, I think the, let me dissect the question too. So the last one was, is an LFP Greenfield cheaper in CAPEX than an NMC?

Tristan Lamotte, Deutsche Bank
Yeah.

Mathias Miedreich, CEO
Was that the question? And the first question was what is the difference in process steps in LFP?
So now I know that we have an expert here also for LFP, which is G.S., so maybe G.S. you can elaborate a little bit around it.

Geon Seog Son, Senior Vice President R&D, Umicore Battery Materials
First LFP can be a function of it. It need a nano size, very small, because it has a different structure compared to the layered one. So the 1D for the lithium diffusion. So they need a very small particle. And then we have to treat them, you know, fine particle with EHS issue and to make a nano size, to make a conductivity, they need also high amount of conduct material.
And then we have to make, well, not we anymore, even though we produce with the joint venture long time, we produced, but we start because of sustainable reason, because CO2, a lot of CO2 and then we don't see anymore, this will be the right technology at the time.
So to make it short, it's a totally different compared to our NMC. It need also a lot of precise coating. And if you'd like to manganese to add, to increase the capacity, we need additional coating step. So according to our study, it is also asking huge CAPEX.
So I don't know who is saying this is cheaper than the NMC. We don't see that way because there is a pre-treatment, a lot, and they need also the furnace and they need also coating step. So all these things, we cannot see there is cheaper or less CAPEX. If they are doing in China, maybe, because the machine and equipment price could be cheaper here in Europe. But basically, I cannot see there is a benefit in the CAPEX, if we build up at the same place, same region.

Mathias Miedreich, CEO
Yeah, and I would say it's very difficult for us to judge on that because we are not in LFP. We can only see our side and we can only benchmark what is in the market. And the only LFP production currently that could be benchmarked is in China where the CAPEX has been highly subsidized from the Chinese government. So it's very difficult to make that math
precisely Euro to Euro.

Tristan Lamotte, Deutsche Bank
Thanks.

I was also wondering if you could talk about the running cost breakdown for production. In other words, what are the key costs proportionally, including personnel, energy, raw materials, and how does this compare between Europe and Asia?

Mathias Miedreich, CEO
I think what you could do, Michiel, is to give a round of what are the big buckets of operational costs that we have. We will not provide a clear breakdown because that's, of course, commercially sensitive, as you can understand that our customers also have this request and we are quite stubborn on that because it's part of our proprietary knowledge.
But I think what you will see already is that the labor intensity is very low, that you can see, but maybe Michiel, you can talk us through some of the…

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, I think some, I mean, in a way, it's the classical budget. I think there's labor to a degree, which is a factor.
Energy is probably one of the most important factors. It differs between pCAM and CAM, but energy remains an important factor in that together with the running of our operations.
We have trade consumption, which is also a point of attention that we are focusing a lot on, too - you will see those trades in our operation as well. Maintenance is another important factor.
But overall, labor, energy, the energy is one followed by labor, followed by other cost, operating cost, I would say.
Yeah, and…

Mathias Miedreich, CEO
And how does it differ?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
We actually, we've got a very good setup from an energy point of view as well. So energy here is very competitive.
Labor rates in Poland obviously are very competitive as well, compared to Korea. Obviously more expensive than China, but much cheaper than in the likes of Germany, of course, as well.

Mathias Miedreich, CEO
So if you, I mean, we always doing this investment committees, right, where we are reviewing the plans for future investments based on customer contracts. What was first surprising for me to see, but its effect is that from a cost competitiveness point of view, operations in Nysa and in Canada are more cost competitive than in Korea, for example. And that comes not from the labor cost or from the utilities that are used, that comes mainly from the throughput improvements. Because with the latest generation of the flexible manufacturing concepts that we put in place here, we have such a throughput improvement that it's overcompensating any factor cost advantages that probably an Asian location would have.
And of course you could say if we would implement that concept then in China, it would be the best of the best. But as we have said, we are concentrating now our CAPEX investment into Europe and into North America.
But one important thing, everybody who will visit the plant later, you will see what you mentioned, the trays. Trays are actually the vehicles that transport the cathode material

through the ovens. They look like simple trays, but actually they also are very important in the whole process.
So I'd like you to listen to that very carefully because they are not only a cost driver, but also influence the function of the cathode material sintering process a lot.

Niels Pecriaux, Millennium
Hi, I've got a question on production allocation because if you do the maths, if I look at your potential clients, ACC, they've got 15 gigawatt target for the next 12 months. If you look at BMW plan, PowerCo plan, they've got a lot of, I mean, if you assume all of this is pretty a big number of gigawatt.
How do you allocate the 21st gigawatt of capacity here? And how can you, I mean, the 20 gigawatt numbers, is it a max number or is it like more a cautious assumption you're making for the first phase?
So that's the question: is allocation of production and max capacity of the first phase.

Mathias Miedreich, CEO
Maybe I give you the question on the max capacity.
Is 20 gigawatt our conservative or aggressive?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
We also been pushed a lot. So we're not sandbagging in our operation given the fact that we want to be efficient in that.
But obviously this is a capacity that we're very comfortable in achieving and we continue to drive to get even better than that. I mean, we have a 20 gigawatt, we're ramping up to 40 at the end of the next year. So we are, by modules going up and we're following basically the customer demand curve.
And that's the same thing in Loyalist. We've got intensive discussions with AESC to understand what's their forecast of demand, when are you going to need which product? And we're following that curve quite closely. We're not commissioning too soon. We don't want to have idle assets. So we're following that curve quite carefully to make sure we have a high utilization in that area as well.
We have clear agreement with our customers, where are we going to produce what.

Mathias Miedreich, CEO
And to answer the first part of the question, it's actually the other way around.
So we are not allocating the capacity to our customers. We are planning the capacity ramp up according to the contracts that we have signed. And of course there is always a gap between available capacity and customer ramp up.
It will never be possible or it would be very risky to have a one-to-one match between that. So we will always have a certain gap. We have more capacity and customer ramp up. But once the operation gets more stable and the customer ramp up is on a stable phase, we're trying to near that lines as much as possible. Here in Nysa, but also in the global setup.
If you remember what we have said about our order book of 190 gigawatt hours in 2026 and the capacity of 195, it shows you already how close we think we can get to this one.

Niels Pecriaux, Millennium [?]
And so there is no risk of bottleneck for your customers and like we saw with our chips.

Mathias Miedreich, CEO
I would say the two-fold question.
For our customers, where we have made commitments to deliver them, this is one of our prime obligations to stick up to our commitment because that's also our USP. Umicore is known to deliver and we do everything to make that happen as well.
And as you have heard, through the modular approach, we have also a quite good de-risking. If something happens, we don't shut down the whole plant but we just focus on that one element that doesn't work. So it gives us quite some good security. Also the copy paste approach of one side to the other is reducing the risk.
Now if you take the macro perspective and that's what we also have said that before, we think that the market for cathode active material in Europe especially but also North America versus the demand, the local demand will be undersupplied until 2030. And yes, there could be a shortcoming situations which is more a market problem, not a Umicore customer problem.

Niels Pecriaux, Millennium *And do you have any numbers on undersupplied market in Europe? I mean, what you've got in mind compared to what you're seeing?*

Mathias Miedreich, CEO
Yeah, so in Europe, we can see that as of today, ramping up to 2030, we still think that in 2030, we have a 15 to 20% undersupply.
In North America, it looks based on the announcement, it looks not so big, maybe it's more 10% of undersupply. But between that and 2030 is one very important thing, it's the ramp up. And one thing I am convinced about is that this massive ramp up of the capacities in the whole industry will not go linear.
There will be some companies who will exactly stick to the plan, others cannot by whatever unforeseen topics.
So on top of that theoretical gaps, you have to put the practical gaps of delays and changes in the ramp ups schedule. So we still believe and I think our customers join us in that belief that this decade will be a critical one in terms of local for local supply of cathode active material.

Niels Pecriaux, Millennium *And the risk of ramp up for Umicore, I mean, how do you think about the phase two and 2024, the incremental 20 gigawatt? Is this something, what is the main risk for, I mean, not to see 20 gigawatt, but only 10 next 12 months?*

Mathias Miedreich, CEO
Yeah, I mean, the risk, there are always, if you have automotive ramp ups, you have two risks, two main risks.
The first risk is that the process that you have selected technology that you are using is not working as expected, number one.
And number two, you have a problem in the execution, in the building, in the actual construction of what you're doing.
I think for the first risk, we are pretty secured because the technology that we're using is not a newly developed one, it's a proven one that we're using here that we did, you will see today, that we are scaling up. Now, the remaining risk, of course, is the actual construction risk, the actual risk that we are not in time, but maybe, **Michiel**, you can talk about how we're securing that.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials

And I think it's important what you will see today, actually, that on the firing fronts, we already have completed all the buildings to go to the 40 gigawatts.
So there is a point in time where we finish construction and we go for internal validation, external validation with our customers as well, which could be a lengthy process. We're actually quite ahead in creating that capacity. So we're confident, and you will see that today, that most of the buildings are there, the equipment and the kit is in. So, I mean, that risk, I think we've mitigated quite well.
Obviously, we had some concerns during COVID, with some concerns on labor availability when Ukraine happened. So we've been able to mitigate that with our contractors quite effectively as well. So we actually are quite far ahead, I would say, in creating that capacity.
And that's needed because there is quite a long time needed to then commission those assets, do pre-safety checks and then validate the products that come out of that plant as well.

Caroline Kerremans, Head of Investor Relations
Sorry, we need to be a bit careful in time. I know that there were still some people here in front that wanted to ask questions. So please, maybe the final two people that can answer questions and then we need to wrap up.
Thank you.

Riya Kotecha, Bank of America
I've got two questions, please.
First, can you compare the flow sheet of carriers in Nysa and what are some operational metrics that you've already seen an improvement in versus our projected improvements? And second, with the pCAM, the complexity of the process in terms of the number of steps seems equivalent to CAM. Is it then fair to say that the CAPEX density of a pCAM plant is similar to a CAM plant? And to what extent have you adapted the pCAM design so that the upstream can be expanded in the same increments as the downstream?
Thanks.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, I think it's fair to say that if we look at the flow sheet, if we have a similar product, we'll have the same flow sheet to get there. It's a little bit more difficult to add in the modules in Korea and China, right? Which is also why we changed it.
But the same product has to follow the same flow sheet. We're making the same product in Korea that we're actually making in Nysa as well. And we're using the same kit.
So that's quite an important one. That's also something that is important for our customers.

Mathias Miedreich, CEO
When you say kit, can you explain what is a kit?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
That's equipment. So we're using the same equipment, the same ovens, the same oven types as well. So I think that's answering the first one.

The second one - pCAM has a much lower CAPEX density. Much lower, it's much more scalable. I mean, the footprint of a 100,000 tons pCAM facility is probably a quarter of

a CAM facility. So it is a big factor lower. So you can scale up PCAM much bigger. So it looks quite complex. It is, and I would be disservice to my colleagues in the in Kokkola to say, yeah, that's simple.
But it also has a very high degree of automation. This is fully process automation, right? So there's no moving bits. It's pumps and pipes and vessels, et cetera. We have one control room where we control the entire process as well. So you only have it in the beginning, you have the dissolution of the metals. In the end, you have the big bags. That's where people come into play. And the rest is fully automated. And that's quite important for us.
So pCAM, much lower CAPEX density. You can leverage scale quite easily. It's also an area where we continue to push for throughput improvements as well. So the development that we do in Kokkola, the one hand side is this micro-engineering of the best structure, as was explained yesterday. And it'd be good to go through those presentations because there was a lot of data given. It's clearly in there and also in here's presentation and how we micro-engineered it.
And that's happening in those facilities, but it's fully automated, including the sampling, etcetera, and controlling the precipitation reaction. So quite…

Mathias Miedreich, CEO
And that I think is an important point.
The magic, as you said yesterday, is happening in the precipitation reactors that are reactors where all of the fancy stuff that **G.S.** has talked about is actually happening.
So if you have that reactor and you know how it works, that's the core of the pCAM. The rest, as you say, is piping and pumping and so on. And that gives us a much better CAPEX density.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, and the same logic there goes, you know, the other question could be, what about the CAPEX density of PCAM versus the old installations? The new installations have higher throughputs. They have much higher throughputs than what we've been able to achieve in China as well with a improved microengineering that we do over there as well.

Again, this is a focus of the engineers to push those throughputs.

Mathias Miedreich, CEO
So let's take the last question, and then I think we have to close.

Chetan Udeshi, JP Morgan
It'll be two easy ones.
First, it's good to see the carbon reduction roadmap. What is the number today? Is it between one to two tons of CO2 per ton of CAM production, any sort of sense of where we are?

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yeah, difficult to quote exact numbers here. What we see is that the existing operations is zero. And in China and Korea, we have a higher number because of the energy mix that we have over there as well. So I won't be able to give you exact numbers there.
We are confident that we can reduce them to net zero in 2035, to be honest. I have no concerns.

Mathias Miedreich, CEO
But we have a number. So what we see, and we made an intensive benchmark on the CO2 intensity of cathode materials. And we have, you know, but going back to the, including the Scope 3, so the supply of the material.
And here we have seen that Umicore is, I think it's 20% or 25% below the average. I don't have the CO2 number in mind, but let's, I will give you the number still today because it's, we will share it maybe around the tour. If not, **Ralph** has it on the top of his head.

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
And it's important to say that obviously Scope 1, Scope 2, Scope 3, 80% is in Scope 3, and 20% is in Scope 1 and 2 of our operations as well.

Chetan Udeshi, JP Morgan *Second quick question. You know, you talked about modular approach, batch production, that typically penalizes your throughput. You're still saying your throughput in Nysa is actually higher than in Korea.*

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
That's correct.

Chetan Udeshi, JP Morgan *So even with that batch processing, you actually are producing more.*

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
Yes, yes. Yeah, and we've been able to mitigate kind of the fact that you have some movements between these different process steps by leveraging and pushing that throughput per batch much higher than we've been able to do in Korea.

Mathias Miedreich, CEO
So there is, of course, you are completely right. If you have a monolithic sequential process for one exact chemistry and you're pushing through that, that should be in theory more efficient than a disrupted approach.
So there is under efficiency that we are compensating by the throughput of the different process steps and what's remaining to be further optimized. And we're not there finally, but it's the transportation of these batches that you will see of the flow bins, how we call them, between the different steps. It's not fully automated today, but that's the idea to…

Michiel De Jonge, Chief Operating Officer, Umicore Battery Materials
And the other thing I would like to say, the batch is very important for product and quality control, right? So we have, I won't quote a number, but with a batch, you can control that batch. And that's super important to understand the product quality. And if your batch is very long, then your product liability is also quite big.
If we have an issue, then you run into issues much easier. So I think that's also a benefit, is controlling that quantity and we can control it, as I explained before, in these process steps as well.
It's very, very, very important, the whole quality control. It's something that has been stressed by battery cell makers and OEMs over and over again. I think this is where we see as the benchmark when it comes to quality production.