



# Global Energy Solutions e.V.

For Prosperity and Climate Neutrality

## Interview Helmut Leibinger

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### **Bert Beyers: What is your function at the Rohrdorf cement plant?**

Helmut Leibinger: I am responsible for two departments. On the one hand, I manage the classic plant construction for the cement plant. In other words, everything that concerns investment projects. Secondly, I have been responsible for decarbonisation since 2020. We have bundled all innovations related to the topic of CO<sub>2</sub> in the so-called Net Zero Emission team.

### **In cement production, a large part of the CO<sub>2</sub> comes from burning lime.**

Yes, we use a lot of limestone. In our case, it is coral limestone, which 40 million years ago bound the CO<sub>2</sub> of the oceans and formed a coral bank. During the burning process, calcium carbonate is converted into calcium oxide, and this chemical process produces two-thirds of our CO<sub>2</sub> emissions. About one third of our CO<sub>2</sub> emissions result from fuel use.

**You operate a carbon capture plant in Rohrdorf – what can you tell us about it?**

The summer of 2020 was decisive, when we were approached by the chemical industry: you have a lot of CO<sub>2</sub> and we want to use it to produce chemical base materials. We were also asked how clean your CO<sub>2</sub> is. We didn't know the answer to this question, and neither did the plant construction company. Typical for the Rohrdorf cement plant as a family-run company, we took the survey into our own hands and said: Okay, then we will build a pilot plant to answer this question. We ordered the smallest possible industrial-scale plant on the market. This pilot plant has now been running very successfully since summer 2022.

**What has been your experience with the carbon capture plant?**

There are solutions for carbon capture and storage (CCS). But we wanted to know: What about Carbon Capture and Usage (CCU)? Because if the chemical industry is already asking us whether they can use the CO<sub>2</sub>, then there is a demand for it. So we built not only the capture, but also a pilot plant to turn the CO<sub>2</sub> into a product.

**And that is happening?**

The CO<sub>2</sub> capture has been in operation since August 2022 and the conversion to a product has been running since November 2022.

**What is being made from the CO<sub>2</sub>?**

We wanted to use technologies that are as energy-saving and efficient as possible. In the first step, we start with formic acid. This is the simplest organic acid, a basic chemical substance for the most diverse applications in industry. We have adopted technologies from universities, which we have practically scaled up on a pilot scale.

**How big is your pilot plant?**

The capture amounts to two tonnes of CO<sub>2</sub> per day. With the large-scale plant at the Rohrdorf site, we are talking about emissions in the order of 2000 tonnes of CO<sub>2</sub> per day. The amount captured is relatively small, but it is enough to answer the question, how clean is the CO<sub>2</sub>? That is a quality issue. The second issue is utilisation, i.e. the conversion of CO<sub>2</sub> into a product. Technologies have existed for decades to produce methanol from CO<sub>2</sub>, for example. But these technologies are very energy-intensive and therefore no longer up to date. Our approach was therefore that we can only produce a competitive product if we have lean, energy-saving production. Here we use so-called electrochemical cells. As in electrolysis, the hydrogen in the cell is directly converted with CO<sub>2</sub> into a product, in our case formic acid. Next, we have set our sights on ethylene.

**Does it pay off?**

Yes and no. We always assume a product price from which we calculate backwards. So it's not the classic "cost wise pricing", that is, I add up all the costs and say that's my price. Instead, I have a price that I achieve on the market for the product and I have to calculate backwards. How do I have to design the production process? That's where we are.

**You are the head of the Net Zero Emission team. Is it possible that you can make the entire plant in Rohrdorf climate neutral with 2000 tonnes of CO<sub>2</sub> emissions per day?**

Yes, we have to do it and we will do it. Our strategy has two fields of action. One is to avoid CO<sub>2</sub>, for example with new cements. Every tonne avoided is the cheapest tonne of CO<sub>2</sub> for us. We will set about 60 percent of our current CO<sub>2</sub> footprint to zero through avoidance. The remaining 40 percent we will then set to zero with Carbon Capture and Storage or Usage.

**Carbon capture and storage generates costs. How do you see the economic perspective?**

Yes, carbon capture and storage costs more than anything else. The money for this disposal flows to Norway, for example. There are only costs and no added value in Germany. With carbon capture and use, I have the prospect of a return. The value added stays in the country and secures jobs.

**By when do you want to be CO<sub>2</sub>-neutral?**

The target range is 2035 to 2038, whereby the leading factor is not so much the cement plant, but the infrastructure. So the sooner the infrastructure is in place, the sooner it will be our turn.

**What infrastructure?**

For CO<sub>2</sub> capture, I need a lot of energy. The electrical energy requirement is more than doubled. In addition, you need extra thermal energy for CO<sub>2</sub> capture. The CO<sub>2</sub> is absorbed from the flue gas in a scrubbing solution - it is clawed out. Steam must be used to drive the CO<sub>2</sub> out of this scrubbing solution again. I need green electricity and thermal energy for this. Two challenges arise from the infrastructure. One is the electricity, and the other is of course - be it CCU or CCS - a pipeline infrastructure with which I can get the captured CO<sub>2</sub> from A to B.

**What are the obstacles on this path?**

The initiatives for pipeline construction are concentrated in North Rhine-Westphalia and northern Germany. Bavaria is clearly left behind and has a clear locational disadvantage. If we look at CCU, the European directives for emissions trading are the main obstacle. The big question is, how is CO<sub>2</sub> recognised in CCU? I don't know if you followed this in the media last year. In Bavaria, we almost ran out of beer. It was almost the end of the world (laughs). In Germany, about 1 million tonnes of CO<sub>2</sub> are needed for the food industry. At the moment, that comes mainly from the chemical industry. It requires a lot of natural gas. If there is no natural gas, there is no CO<sub>2</sub>. As we

know, this was the case last year and the lack of CO<sub>2</sub> drew attention to the cement plant as a source of CO<sub>2</sub>. We were asked hand in hand: You have a pilot plant, can you perhaps set up a CO<sub>2</sub> supply?

**And your answer?**

Yes, we have really put our backs into it. But first of all, it's only a pilot plant with two tonnes of CO<sub>2</sub> per day. That's not enough to save the Oktoberfest now. Secondly, we have to create the quality for the food standard. The third problem is that our CO<sub>2</sub> must be accounted for in terms of emissions trading. The CO<sub>2</sub> must be permanently removed from the atmosphere. Everything that goes into food, be it for mineral water, for protective packaging or for industry, such as welding gases, is not permanently removed from the atmosphere.

**If we think beyond the plant in Rohrdorf. Do you think it is possible for the German cement industry to achieve Net Zero?**

I think it is possible for the cement industry in Germany to become CO<sub>2</sub>-neutral. It is also working very intensively on this.

**And here we are with the mechanisms we have already talked about, firstly avoidance, secondly CO<sub>2</sub> capture.**

There is a bouquet of measures, but these are the two big levers. We are also working on how to use hydrogen in combustion. How can I design the combustion process differently - up to and including mineralisation, i.e. recarbonisation is the technical term for it. How can the concrete bind CO<sub>2</sub> again?

**Do you think this will work economically?**

Yes. Carbon capture and storage will definitely work and must work – that is the obligation. Whether the freestyle – CCU will pay off remains to be seen.

**But it will be more expensive.**

Yes.

**I admire your optimism.**

I think the technologies are there. The will of the industry is there and the understanding is also there. If the state now joins in, we will achieve climate neutrality.

**Do you think that this can also work globally? We are now talking about India and China, for example.**

Two years ago, the European Cement Association gave a presentation that the Chinese are also dealing with the topic of CCS. There is already a plant in operation there that, as far as I know, captures about 50,000 tonnes of CO<sub>2</sub> per year. I can say little about India. Last year I was at a conference in Amsterdam. There was a representative of an Indonesian company from the oil and gas sector. There, too, the old oil and gas fields are being offered as CO<sub>2</sub> storage sites. So I think this is not only a topic that concerns Europe, but also the Asian region.

**Will you personally experience this? Also in Rohrdorf?**

As I said, we have a relatively concrete plan for the topic of avoidance and also for the topics of CCS and CCU. We have a clear roadmap until 2035/38, depending on how our environment develops. That brings us back to electricity and pipeline infrastructure.

**And what else will you see from this?**

I will still see all of it. According to plan, I will retire in 2039. That means I will still see it all in operation. That is my professional goal, to bring our cement plant to Net Zero. More precisely, our two

locations. Because we have two plants, one in Bavaria and one in Austria.