Interview Jens Wagner

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Bert Beyers: Perhaps you could introduce yourself first?

Jens Wagner: I studied process engineering 35 years ago and have been working in this field ever since. I deal with large-scale plant construction. I have done research and development, technology development, project development, for large companies, for small companies. My fields include hydrogen, methanol, ammonia, synthesis gas. I worked for thyssenkrupp for 15 years and before that for Lurgi (now Air Liquide) for 15 years. And now I've been self-employed for two years, together with former colleagues.

Your projects are international, none of them are in Germany. What are they about?

They are small and large projects, up to investments of billions. We also have patents on the technology. These are then grey projects, as we say today. That means they are fossil-based. They produce for example ammonia, methanol or hydrogen for the chemical industry.

Fossil-based, for example, is blue hydrogen, produced from natural gas, but with co_2 capture. In Germany, however, only green hydrogen that comes from renewable energy is considered good hydrogen. How do you see that?

Green means that we have low CO2 emissions in hydrogen production based on a life cycle analysis. Blue means we use fossil-based natural gas and then perhaps have more or even less CO_2 emissions. And so neither blue nor green is properly defined. To do it correctly, I have to evaluate it quantitatively, which is what we are doing. How much CO_2 is produced per

tonne of product? The product is hydrogen, ammonia or methanol. And then I can do as well with the so-called blue hydrogen as the green hydrogen is in Germany. Or even better.

Hydrogen produced from fossil sources has a better CO_2 balance than hydrogen from renewables?

Exactly, marginally better. But we can also say that if it were equally good, it would still be adequate.

Could you describe a concrete project?

As an example, I take a very large blue ammonia plant of the company Nutrien. For this I need hydrogen, which has to be as low in CO_2 as possible. In the USA, where the project is, 90 per cent capture rate for example is sufficient for the legislature. Once the plant is completed, 3,500 tonnes of ammonia will be produced there every day. Every year, we save as much CO_2 as about 1.5 million cars emit in Central Europe.

What is done with this ammonia?

Fertilisers are made from it, for example. For the traditional business, about 150 million tonnes of ammonia are produced globally every year. Alternatively, ammonia can also be used as an energy source, for example to power ships. There are no more CO_2 emissions when the ships are sailing on the sea. Ammonia consists of nitrogen and hydrogen, so no carbon, no CO_2. You can also run power plants with ammonia. There are projects in Japan that use it in addition to natural gas or oil. Ammonia is then fed into these power plants and CO_2 emissions are reduced. Ammonia can thus be an energy source or a basic chemical for industry.

Where in the USA is the project?

On the Gulf Coast.

How much does a kilo of hydrogen cost in this application?

Because this plant is so big, we get an economy-of-scale effect. The hydrogen is even cheaper than the one I traditionally produce from natural

gas. So: the blue hydrogen is cheaper than the grey hydrogen and many times cheaper than the green hydrogen from electrolysis.

Can you give a figure for the price?

That's difficult because I don't know what the natural gas for example actually costs. Estimated it is less than 1 US dollar per kilogram. It's cheaper in the US for many reasons. The legislation wants to support it. The CO_2 that is captured there is injected and for this CO_2 you get additional money in the form of certificates. 70 US dollars per tonne, that's gigantic. That means the hydrogen costs almost nothing. If you take all that into account.

Where is the CO_2 from ammonia production injected?

First of all, it has to be said that this has been done in the USA for a long time, for decades. If the pressure in an oil or gas field drops, it can be raised by injecting CO_2 or nitrogen into these reservoirs. The CO_2 stays in there. It can't come out because it's heavier than natural gas. So it settles at the bottom and pushes the existing natural gas upwards. And I can then extract that in addition. That means I increase the possibilities of getting natural gas or even crude oil. And that's why the CO_2 in our plant is an additional product. And for that you get money. Not only the hydrogen, not only the ammonia, but also the CO_2 is a product that this company sells.

Critics say that the injection of CO_2 in these cases leads to further extraction of oil and gas and even more CO_2.

In this case, it is natural gas that I am extracting. And I use that to produce CO_2-low hydrogen. And I compress the CO_2 again. That means no additional CO_2 goes into the atmosphere. Compared to the traditional production of ammonia, I save a lot of emissions. As I said, these are the 1.5 million cars per year.

When we talk about the global production of low-CO_2 hydrogen from natural gas, where are the scaling barriers?

Well, I don't really see any. The only problem might be with the CO_2 itself, if I'm too far away from a place where I can compress the CO_2. Then I have to transport it somewhere at high cost. An example would be Germany. We don't want to inject CO_2 here, so I have to transport it by pipeline to the Baltic Sea coast. From there, a ship brings the CO_2 to Norway. There it is injected, because that is allowed in Norway and not in Germany. And the

whole thing is actually an energy and money-destroying machine. It could also be injected here. There are plenty of deposits, especially in the North German Plain. Where there used to be natural gas, you could inject the CO_2.

Germany seems to be a special case. Why is the discussion about carbon capture so difficult here?

The only thing that comes to mind is that people are technology-phobic and have no confidence in technology. Which is unfounded at this point. I have spoken to German politicians. They tell me, then I have a new problem for future generations. I now have the nuclear waste issue with the waste and with CO_2 I do something similar. But it's simply not comparable. CO_2 can not only be injected into former gas and oil deposits, it can also be mineralised. It becomes a solid. And in natural gas deposits, the CO_2 settles at the bottom. The natural gas has not come out of there for millions of years. But you have to look at it. I wouldn't say that it's all easy. You have to plan it carefully, for example, determine the geological structure, draw up expert reports and then see how you can implement it.

You spoke of hostility to technology in Germany - what do you mean by that?

You can look back a long way. Germany used to be a very innovative country. After all, the Haber-Bosch process came from Germany. Or the Fischer-Tropsch synthesis for the production of fuels. Today it's difficult. In the end, I don't know, but I notice that other countries are much more open. Otherwise Norway or England wouldn't do it. Our company has projects in the US and the Middle East, ten projects in total.

Because it pays off?

Because it pays off because of the government subsidies. Besides, I can sell the CO_2. Many companies are trying to get their hands on this pot very quickly in order to profit from it.

We talked about unconventional gas production methods in the USA. Would something like that be transferable to Germany?

A lot of gas was once produced in Germany. But as far as I know, production is almost at zero because the deposits are simply used up. There is nothing left. If we had CO_2 now - but we haven't had that in Germany so far - and injected it there, we could still get natural gas out of

these deposits. Just like in the USA. Maybe we could cover Germany's entire natural gas consumption for five years with it. That way, without fracking.

Where could the CO_2 for this come from?

It could be extracted from all power plants. We could do it in steel production and we have steel companies, thyssenkrupp or Salzgitter. I used to work at thyssenkrupp, and there we were very much concerned with making steel as CO_2-free as possible, in other words, making so-called green steel. You could also capture CO_2 in cement plants or in the chemical industry. The CO_2 is there, but it is not usually captured.

You mentioned fracking. That is also considered a no-go in Germany. What is your position on this?

It's not as simple as injecting CO_2. I consider injecting to be largely harmless. With fracking, I have to be a bit more careful. Fracking in the real sense has been done for a long time, also in Germany since the 1960s. The gas doesn't come out on its own, something similar is done. Only this is a more harmless fracking. Today, in the USA, it's done with pressure. Water is taken and forced into the natural gas deposits. The water also contains sand. And what is perhaps the most annoying thing about it is that there are also chemicals in it. Theoretically, they can get into the groundwater. Of course, one wants to avoid that at all costs. That means you have to analyse it very carefully: Where are the groundwater layers? Where do you drill? Where do you drill? In addition, one is afraid that shifts will occur, perhaps resulting in landslides or earthquakes. In Canada, I have seen such drilling myself, including the effects on nature. I think it's done very considerately there. If it's done that way, I think it's harmless.

Also in Germany?

Also in Germany. There are analyses. We don't have gigantic reserves, but the entire natural gas consumption in Germany could probably be generated for 10 to 15 years. In that time we wouldn't need Putin gas at all. We would have gas ourselves. And so we could perhaps bridge the current phase in which this raw material is scarce.

Which countries could Germany learn from?

Norway is already doing this by injecting CO_2 to increase the pressure in the natural gas field. They do it in England and there are also plans in the

Middle East and, of course, in Russia. Russia is one of the countries with the largest natural gas reserves. They are doing this massively there because they simply want to exploit the natural resources. We also had projects there before the Ukraine war. Now it's all fallen asleep, logically enough. I could also mention Australia. All over the world, people are ultimately doing or planning this.

Projects for the disposal of CO_2: What are the most interesting ones for you?

If you look at Europe, as far as I know there are about 40 projects where people are thinking about it. Not in Germany, though. I have already mentioned some countries. I find Norway very interesting. The Norwegian government has said that they could inject all of Europe's CO_2 emissions into natural gas fields over many years. In the USA, a lot of oil has been extracted with this method and the additional gas production is huge. Accordingly, gigantic amounts of CO_2 can be disposed of there and then we can look further. There are many projects in Australia, in Africa there have been considerations, also in Mexico. There are even institutes that deal exclusively with such things, where you can then ask whether it is possible for them to support you in order to research the geology that is necessary to make injection possible.