



Trianel

Bunkering at Europe's Largest Cavern Field

Dipl. Geol. **Christian Rohde**, Managing Director of the TGE, is a major advocate for natural gas storage in caverns; that means in concrete terms he absolutely supports the technology which he developed for the storage at Epe. Included here is a compressor design, which fits into the complete concept of the storage plant as well as the technical expertise of the compressor supplier. Mr. Rohde has visions: In the long term he wishes to be one of the team creating the European network system. However he is prior to that planning the implementation of an innovative concept of Power-Heat-Coupling with a "lighthouse character". **Martina Frenz** (NEA) won him over to give an interview.



What is Trianel?

Mr. Rohde: The Trianel Group is the largest network for local power utilities in Europe and has a presence in many EU states, either directly, or through partnerships. Trianel currently has 42 municipal utility companies and local suppliers as shareholders, with approximately 70 additional companies as partners.

What motives were there for founding TGE?

Trianel Gasspeichergesellschaft Epe (TGE) was founded by 14 municipal energy suppliers in 2006 in order to further develop the supply of natural gas at the local level, independent from the established gas industry. The "Epe gas storage facility" project, however, had already been in existence as early as 2004. It only took 18 months from the initial concept to securing investment from the local authorities. This is a comparatively short time period for the development of a new site.

Which company runs the cavern storage facility today?

TGE is solely responsible for planning, constructing and running the storage facility.

How did the first contact to NEA Deutschland (NEAD) come about, and at what phase in the design of the cavern storage facility did NEAD join the project?

To tell the truth, NEUMAN & ESSER (NEA) has been well known to me in the field of piston compression technology for a very long time.

My first contact with NEA in connection with the Trianel natural gas storage facility came when searching for advice on the machine technology and less through NEA products themselves. TGE first wanted to understand the technical process before further developing its commercial plans for energy management.

This meant that NEAD joined at a very early phase of the storage facility project and proved to be a great help at that stage. This would not have been so easy to achieve with some of your competitors.

The engineering of the gas storage facility and the pan-European tendering process for the compressor technology were carried out by an engineering service provider. In total, seven companies took part in the tendering process. The evaluation was not solely based on the size of the tender but also on the scope of service, the technology, reliability and the mechanical design, all of which needed to suit the overall concept for the facility. NEAD was able to prevail against its competitors by making, what was in our opinion, the best technical and commercial offer.

How would you rate NEAD for the completion phase of the first three plants? Were the first three plants delivered on time?

Completion was very professionally handled across the board. Intensive contact during the completion phase helped a great deal. This has less to do with geographical proximity of company headquarters in Aachen and





Übach-Palenberg and much more to do with the fact that the game of question and answer was played with a high degree of commitment and success by both sides. The timing of the delivery was never in doubt and you clearly exceeded our expectations. Even during the phase cavern construction, and particularly the first filling of the caverns, NEA was quick to support us with solutions to problems, such as rapidly installing a control system, an additional request made during the completion phase. This was installed within a few weeks, even ahead of the delivery date, a great achievement!

Did NEAD or NEAC have to overcome any hurdles during the installation or commissioning stage?

Yes indeed, both NEAD and your service company NEAC had to overcome a great many literal obstacles, when you consider that several hundred people were working simultaneously on the job site. The conditions under which the installation took place were far from mundane.

Simply negotiating their way around a 40,000 m² building site while managing the logistics for delivering the large molded parts was a great challenge.

In particular, the staff responsible for this proved to be extremely flexible. Their cooperation with other companies was also exemplary. They were able to organize support from other companies independently, where necessary. That is a sign of great experience and demonstrates the large amount of trust we placed in their competence.

Do the compressor systems meet your expectations under operating conditions?

The three compressors were commissioned respectively in Oct. 2007, March and May 2008 and have been operating since then "completely satisfactorily". We haven't been able to run any performance tests so far as with the caverns currently almost completely empty, we can't create the necessary full pressure. However, we intend to run the performance test within the next six months.

What is necessary for a storage facility to run profitably, in your opinion?

There is no doubt that

the compressor lies at the heart of the storage facility in terms of filling. The profitability of the facility is entirely dependent on the technology used and so also on the reliability of the compressor.

It is important for us to have the best plant in both technical and commercial terms. There is no benefit to TGE in installing technology which is very good, but then proves to be so expensive to run that there is lasting damage to the commercial viability of the facility. On the other hand, there is no use in our buying "cheap jack" technology.

Given these parameters, NEA has so far fulfilled our expectations completely. The coming years will show how overhead costs develop, in terms of repairs and maintenance, but judging from the experience we have had so far, we expect the assurances given by NEA to be fulfilled.

To what extent was NEAD able to contribute to your general plan to create an energy-efficient cavern storage facility?

We put a lot of collaborative effort into ensuring that the motors, machines and cooling systems etc. were efficient, although the overall service package was provided by NEA. I believe the result we have achieved together is close to optimal. We can't get any more out of this technology at this point in time.

In later bilateral discussions, which I occasionally have with *Mr. Ritzen*, we came up with the idea of a gas turbine-driven power plant. The goal is to make the gas storage process more efficient and at the same time to find a solution for the insufficient power supply in Epe for the fourth NEA compressor, which requires almost 8 MW to run.

The need for building a gas turbine power plant has now been agreed on at the shareholders' meeting. The novelty in this solution is the combining generating electricity with the decoupled thermal energy produced in the storage process. The heat created in generating the power is then also used to pre-warm the gas.





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As far as I know, this combination of the heat and power cycle (CHP) and gas storage technology so far does not exist in this form in any gas storage facility in Germany and is therefore being viewed by politicians at both state and federal level as a flagship project in terms of environmentally friendly technology, although we do not have authorization from the regulators to go ahead as yet. In particular, the future heat accumulator, which has the appearance of a narrow but tall water tank, poses a construction challenge as it is difficult to integrate into the surrounding landscape.

What were the motives for extending the storage facility?

The answer is obvious. The energy markets are set up in such a way at the moment that more storage capacity is needed in Germany and can be run successfully on a commercial basis. The additional cavern will allow Trianel to raise its storage capacity from 150 to 240 million m³.

To meet the storage requirements, three machines were installed for the first three caverns. As we have now integrated the fourth cavern into the facility, which is significantly larger than the first three caverns, we now need more in and out performance capacity.

Would you have considered a different compressor concept, given the same flexibility in terms of flow rate and compression ratio?

The Trianel storage facility is the only storage facility in Epe connected to three different transport networks. These have very differing levels of operating pressure. The resulting compression requirements meant that we only considered piston compressors from the outset. The great suction and pressure range the NEA machines are designed for is what convinced us.

Our mechanical needs in extending the storage capacity were almost identical, in addition we also wanted to take advantage of synergies in combination with the first three compressors. This is we opted for an NEA compressor once again.

The requirements were that compressor no. 4 have the appropriate capacity to deal with the equivalent expansion in storage volume. This means that this machine must deliver almost twice the amount of its predecessors.

This time it was Trianel itself who carried out the pan-European technical tendering process.

NEAD proved successful in the tender, even against new competitors taking part. This meant that the stipulated additional synergies were made possible, for example as the most important core and wearing parts are identical, which also had a positive effect on the proposed maintenance and spare parts agreement.

What appeals to you particularly in the overall maintenance concept of the NEA GROUP?

The maintenance contract will initially run for 5 years, with the option of a long-term extension.

No risk can be allowed in this kind of project. This is why we have signed a full service agreement with NEA, which extends automatically. The first machine is facing its first 4,000 hour maintenance check, in which we don't anticipate any problems.

What is the progress of construction on the extension to the facility?

The first filling is planned for May, but not using machine no. 4. This will only come into operation one year later. During the first filling, the saltwater is





expelled from the cavern by the gas, this requires a great deal of capacity as it must take place very gradually.

Which countries supply your natural gas, and in what quantities?

The gas belongs to our storage customers. We do not know their sources, though from the composition of the gas, we can make some assumptions about which countries are supplying it.

We are currently receiving gas from Norway and Russia, though as mentioned, this decision is taken by our customers. Similarly both the volumes delivered and the route taken are managed by our contractual partners, and not by TGE.

What is the value of the stored gas, on average?

This is subject to great variation in the market price for gas and the amount of gas currently in storage. When full, the facility holds gas in the value of tens of millions of EUR. Objectively speaking, the true value is dependent on the prices our customers paid for the gas, which we naturally are not party to.

How do you think the gas market in Europe will develop?

We certainly need an increased market in storage capacity. I am a great proponent of this technology and believe that more storage facilities should be built in Germany, where the geological conditions allow for it. Other countries, such as Switzerland, are extremely underprivileged in terms of geology and therefore have to rely on the European network. I definitely see further developments in this area.

What value do storage facilities have for the consumer?

It is very clear that these facilities secure the supply of natural gas for industry and private households and allow price variations to be evened out. The gas is bought in the summer months when it can usually be sourced cheaply through the international markets.

Is Trianel considering extending this storage concept and building further storage facilities?

Of course this is dependent on the way the market develops, but speaking from today's point of view, I can answer with a definite YES.

Would you rely on the same compressor concept again?

Once again a resounding YES, although I would also like to convince some of my other colleagues with our compressor concept, and the idea behind it.

Of course there are also other concepts available, but the technical and commercial aspects of these are not as convincing.

What is your vision for Trianel?

We aren't one of the big fish in our industry but I can well imagine us playing our part in helping to build European networks in the long term. We are already actively participating in developing the market and want to continue to work in future for an increased liberalizing of the energy markets.

The NEUMAN & ESSER GROUP wishes Trianel every success for the future and you personally, Mr. Rohde, continued strength of conviction. And thank you for taking part in this interview.

Trianel Gasspeichergesellschaft Epe mbh & Co. KG (TGE)

- incorporated in 2006 in Epe close to Gronau
- purpose: amalgamation of 14 municipal utilities for supplying of natural gas
- working gas volume of the cavern storage system built in Epe: 150 million m³ - complies with an energy supply performance of approximately 1.5 billion kW/h
- storage performance: 150,000 m³
roll-out performance: 300,000 m³
- increase the working gas volume to 240 million m³ through development of the fourth cavern; first filling in May 2009
- total driving power of the four compressors at the location in Epe: 16 MW
- discharge pressure per compressor unit: 232 bar(a)
- controllable flow rate during feeding process: between 15,000 and 70,000 Nm³/h for the four-crank compressors; 75,000 and 150,000 Nm³/h for the six-crank compressor