

## Where is the world of pressure cylinders heading?

High pressure cylinder producers are nowadays facing monumental challenges. There are traditional disciplines such as transport of industrial gases, extinguishing technologies, food industry, hobby cylinders... But currently new challenges are knocking on our doors in the form of hydrogen, bio CNG and RNG transport and storage. We are getting to the brink of a new world, which will push humanity forward. Until the 20th century, all existing technologies, that didn't require high pressure storing or were stored in employed gas storage under 120 and 150 Bar pressure, were used up. However, the storage and transport of hydrogen and RNG depends on entirely new technologies.

In the 21st century we have great challenges in front of us in the research and development of hydrogen technologies. If someone were to tell me 20 years ago about 500, 700, 1000, 1100 and 1350 Bar cylinders, I would have told him it's a great step forward in development, however what are we going to do with them as nobody needs such cylinders.

However, today we are in a completely different situation. Luckily, we have a ten-year-old research and development phase behind us and now it's time to show the capacities of production. What seemed like a fiction is now after two decades a reality and we are dealing with the development of production capacities for Type 1 steel cylinders. Of course, we are thinking in the future and already now we are in the process of developing new products for the storage and transportation of hydrogen, all together in a complex solution including service and leasing.

The hydrogen world is in its very beginnings and we have solutions for very complicated and big projects on all continents. Nevertheless, on the first place for all technologies is safety. Our now almost 120-year history is binding us to develop and deliver solutions with absolute safety. I think that this is the imperative for all cylinder producers and I hope that no one will be subject to „easy” and risky solutions.



**Jan Světlík**

CEO of CYLINDERS HOLDING a.s.

# Cylinders Holding is ready for **the hydrogen age**

Hydrogen is an element, which is today mostly connected with the future of human society and sustainable energy sources. Hydrogen technologies are a very perspective sector and not only in Europe. They are to engage with all aspects of our everyday lives. Thanks to new hydrogen technologies we will be driving to work, on holidays, heat up our homes and shine our lights, use the waste, produce new materials. With the growing trend of using sustainable fuels, the need for transportation and storage of hydrogen will grow as well.



In Cylinders Holding we are ready for the hydrogen age. Thanks to development of new technologies, we are always innovating our products for new hydrogen segments. At the same time, we are getting ready for the use of green and other hydrogen technologies in our production plants. In a relatively short time the Cylinders Holding group has presented the world with many new products. Between these are seamless steel cylinders for 500 and 1000 Bar, ultralight cylinder for hydrogen with inner bottle neck, trailer that transports up to 500 kg of hydrogen under 200 Bar pressure and now recently our "family of smart storages", which brings a significant comfort and safety for the operators. This is however not the end. We are in the process of preparing new products, that will improve quality and enable even easier access to hydrogen technologies. Together with the company Vítkovice a.s. within the production sites of our company we were able to build the first hydrogen filling station for 700 Bar in the Czech Republic.

- **We own the first hydrogen vehicle in the Czech Republic**
- **For this year's spring we plan to open a unique testing site for hydrogen cylinders in Europe**
- **We are readying a device for cleaning hydrogen storages for green hydrogen**
- **We are building a photovoltaic power plant to "green" our production and we are preparing to produce our own green hydrogen while using all the waste products in our production process, this means oxygen and heat**
- **We strongly emphasize to increase the carbon neutrality of our production**



# 02

PRESSURE VESSELS  
FOR HYDROGEN,  
CONTAINERS  
AND BUNDLES

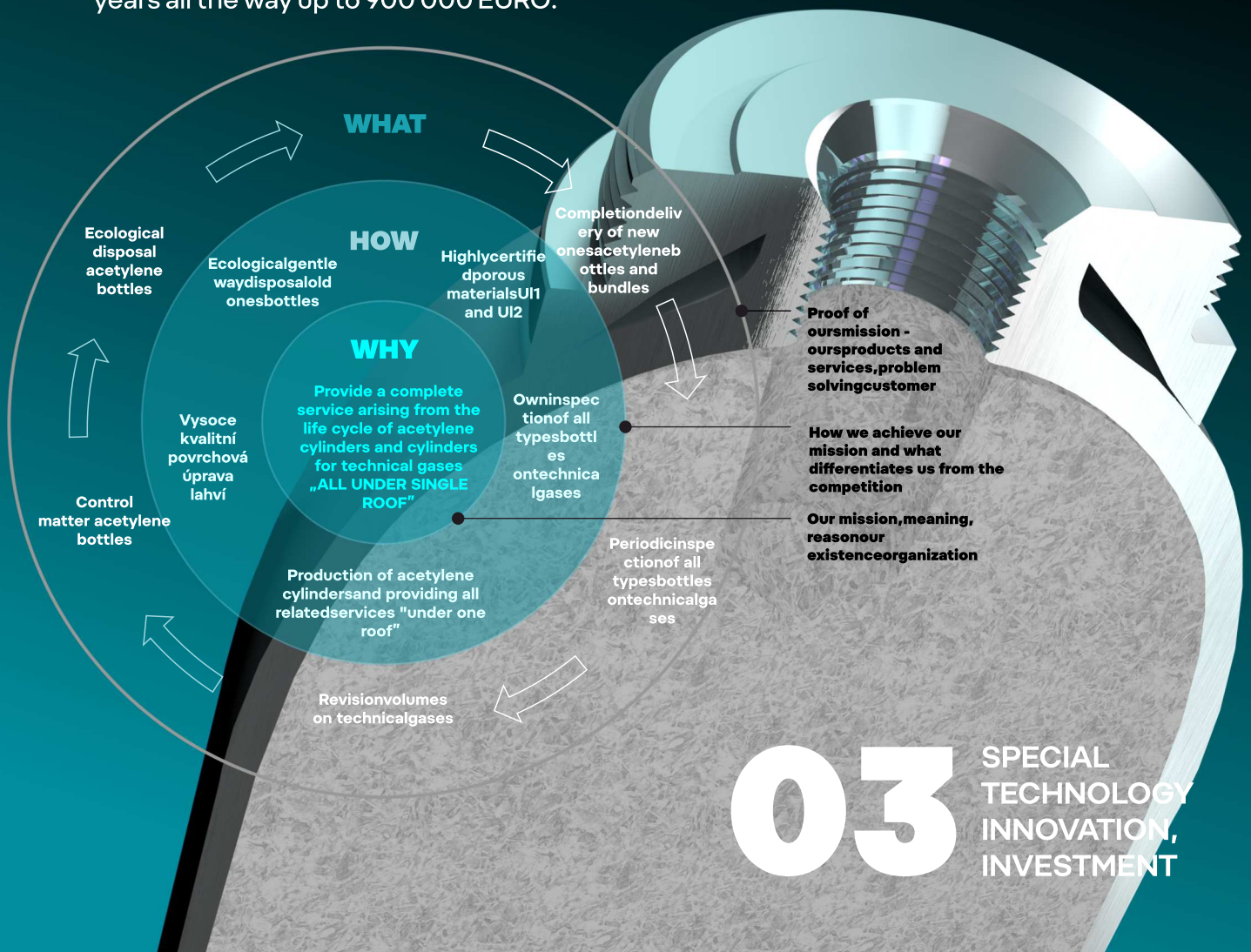


# INTRODUCTION OF TECHNOVIT

**TECHNOVIT, before named company LINDE VÍTKOVICE a.s., has become in the middle of January a 100% subsidiary company to joint-stock company VÍTKOVICE. This company from Ústecký region with many years of experience, whose beginnings date back to the first half of the last century, is focused on producing and filling of porous matter into acetylene cylinders, cylinder revisions for technical gases and ecologic disposal of outdated acetylene cylinders.**

The visions of TECHNOVIT company come from the so-called golden circle. This consists of providing the whole service, resulting from the life cycle of acetylene and technical gas cylinders, all under "one roof". TECHNOVIT company is awaiting a series of investments into new technologies enabling an increase in total capacity and automatization as well as investments into reduction of energy demand. A substantial part of the new strategy is the expansion of scope in the area of new acetylene cylinders completion for new markets, where we are already in the process of acquiring the Rho mark for British market and D.O.T. certification for the US market.

An important point of the new strategy is an expansion of the spectrum of customers in the areas of revisions and ecological disposals of acetylene cylinders, where we are the only company that guarantees a 100% recycling of all cylinder parts without creating any environmental burden. Depending on the increase of production capacities we are also planning to increase the number of our employees. Already this year we are expecting to double our sales compared to the last year (220 000 EURO) and increases in the following years all the way up to 900 000 EURO.



# CYLINDER CLEANLINESS USED IN FOOD INDUSTRY

The company Vítkovice Milmet in Polish Sosnowiec is implementing an investment project aimed at the development of technologies for internal cleaning of cylinders and building of a new technical line for cleaning of pressure vessels used for the transport of oxygen, medicinal and food industry gases. The parameters of inner surface cleanliness exceed by far the parameters set by the gas distributors. They set a new European standard in the area of technical cleanliness of cylinder inner surfaces.

At the moment there are no standard requirements in existence, that are pertaining to the inner cleanliness of pressure vessels (cylinders) used in food industry in relation to the national and European standards and guidelines (EN). The analysis of the tests run on prototype device used for cleaning cylinders has enabled to set requirements for the inner cleanliness of cylinders. These in turn set the parameters required for the new investment.



*Sample photos of filters after performing the extraction of impurities in cylinders designated for the food industry*



*Pollution of vessels imported into Europe*

## **he investments will help us reach the following parameters for cylinder cleanliness**

1. Non-metallic particles of size  $< 350 \mu\text{m}$
2. Metallic particles of the size  $< 350 \mu\text{m}$
3. Impurities max.  $5 \text{ mg/m}^2$
4. Humidity  $< 50 \text{ ppm}$
5. Hydrocarbons  $< 10 \text{ mg/m}^2$
6. Without smell

## **The new investment of Vitkovice Milmet includes:**

- Technological lines for cleaning of the inner surfaces
- A lab for complex tests of technical cleanliness of the inside of cylinders

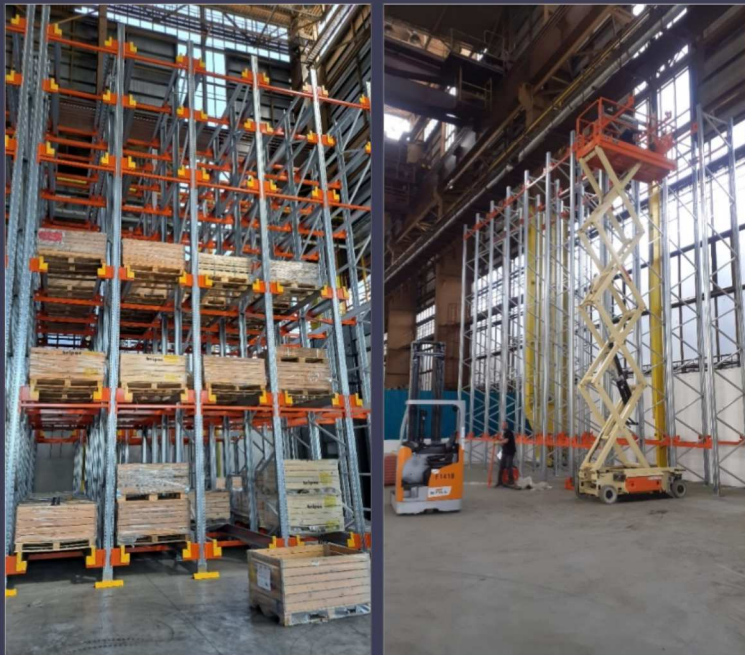


*ollution of vessels produced by Vitkovice Milmet*



# NEW CONTROL SYSTEM OF THE PRESS

At the beginning of the year a control system replacement has taken place on our oldest plant. A modern system, that guarantees fault-free production, is able to analyze a massive amount of incoming production data. Among the most important is the output of pressure curves during pressing process. Thanks to these values we are able to detect production anomalies in advance connected to demanding production of semi-product.



## SHUTTLE STORAGE

In the recently renovated part of the tallest hall in the production area of Vítkovice Cylinders in Dolní Oblast Vítkovice in Ostrava during a few days a new high-capacity shuttle storage has been constructed. It is 10m tall where a maximum weight of storage per pallet is 1,5 tons. Thanks to the shuttle cart the storage is automatically loaded and unloaded. The manipulation with packages into the highest floor is realized with a retractor vehicle. Special cameras are placed on the pitchforks to allow safe manipulation at this height. The whole storage allows over 1 400 pallets inside.

## PRESSURIZATION AT 500 AND 1000 BAR IN CONTINUOUS FLOW OF PRODUCTION

As part of the production of 500 and 1 000 Bar pressure vessels for hydrogen we have made such investments, that allow us to produce at a closed and continuous flow of production. In the following pressure testing we have increased the pressure source to 1 680 Bar and improved safety of control cabin by installing a camera system. Mentioned improvements will help us flexibly react to the increase of demand for high pressure cylinders.





# Events of the year 2022

of the Cylinders Holding group in dates





- January** ■ Company Vitkovice Milmet received the confirmation about the finalization of the certification process according to VDA ISA "TISAX"
- February** ■ Company Vitkovice Milmet received an award "Diamond of the year 2022" from the prestigious Forbes magazine
- March** ■ Control system change has begun at plant 1 in Vítkovice Cylinders
- April** ■ Second phase of the reconstruction of hall for storages has begun  
■ Beginning of expo in Sosnowiec focused on cylinder production history celebrating 140 years since the company was established
- May** ■ On the 1st of May we had an "open door day" for workers with their families and outsiders  
■ Presenting at Hannover Messe fair in Germany
- June** ■ Grand opening of the first hydrogen filling station in the Czech Republic  
■ Presenting at the biggest world firefighting expo Interschultz in Hannover  
■ European Business Institute has issued an award "Strong and reliable company" to Vitkovice Milmet
- July** ■ Meeting and presentation of hydrogen technologies to ambassadors and executives from the whole EU in Dolní Oblast Vítkovice in Ostrava  
■ A recertification audit by KGS for South Korea has been successfully carried out
- August** ■ A meeting of our affiliations has taken place in Landek park in Ostrava – the main topics were development of sales department and exploring new possibilities
- September** ■ Presenting at Fuel Cell Expo in Japan  
■ Organisation on ECMA meeting in Ostrava  
■ Participation in the worlds biggest gases expo in the world Gastech in Milan, Italy  
■ Participation in energy forum "Leading Minds Forum"  
■ Vitkovice Cylinders have organized a football tournament for its employees
- October** ■ Vitkovice Milmet have produced their one millionth propane-butane cylinder  
■ Presenting on "Dawn of Hydrogen" expo in Brussels regarding solutions for transport and storage of hydrogen  
■ Presenting our solutions for hydrogen to MEPs in Dolní Vítkovice in Ostrava  
■ Participation in the biggest hydrogen expo in Germany – Hydrogen and Carbon Capture Technology Expo in Bremen  
■ We have reached a record one month turnover in October – over 22 MIL EUR
- November** ■ Final touches to the reconstruction of storages hall  
■ Participation of our Dubai company on the expo OFSEC, Oman Fire in Oman – the biggest firefighting expo in the region  
■ Meeting with the representatives from the Industry Union of the Czech Republic in Gong auditorium in Ostrava  
■ Meeting with all production companies in Polish Beskydy mountains regarding 2022 results and plans for the year 2023
- December** ■ Finishing of new type of bundles for CNG-1 for trailer vehicles on the basis of 152 L cylinders from Vitkovice Milmet  
■ Participation in MENA expo in Saudi Arabia  
■ 23. 12. we held a regular Christmas paunch for our partners and our employees

# Where to meet us? 2023

Cylinders Holding group will be available on several trade fair across Europe and the United States. Our first stop will be HyVolution in Paris which takes place from February 1st and ends on the 2nd. Our next stop will be Hydrogen + Fuel Cell Expo in Hannover starting on April 17th and lasts for the whole week. At the fair you will be able to see our latest solutions. In May we will be present at the Forum CNG-LNG-LPG in Warsaw, which takes place from the May 9th and ends on 11th. Staying in Poland, another trade fair takes place in Poznań from the May 16th until 17th. Here will be present at the Środkowoeuropejskie Forum Technologii Wodorowych H2. Our last fair, that we are planning to be a part of, takes place in Bremen from October 27th until 28th. The name of the event is Hydrogen Technology Expo and we will be there for the 3rd time in a row this year.

On all of these events we will have our booth filled with our newest technologies and solutions for our customers. Our people on the stands will be happy to answer any of your questions regarding hydrogen technologies, such as transportation or storage of hydrogen. We as a company really see the possibilities of Hydrogen in the future and would like to be a part of bringing this Innovation to the world. We strongly believe that our solutions to some of the hydrogen problems around the world are the best on the market and we wish to show them to the world to see.

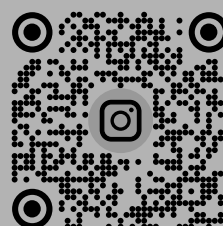
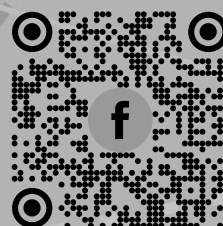
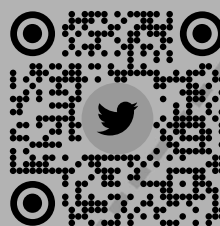
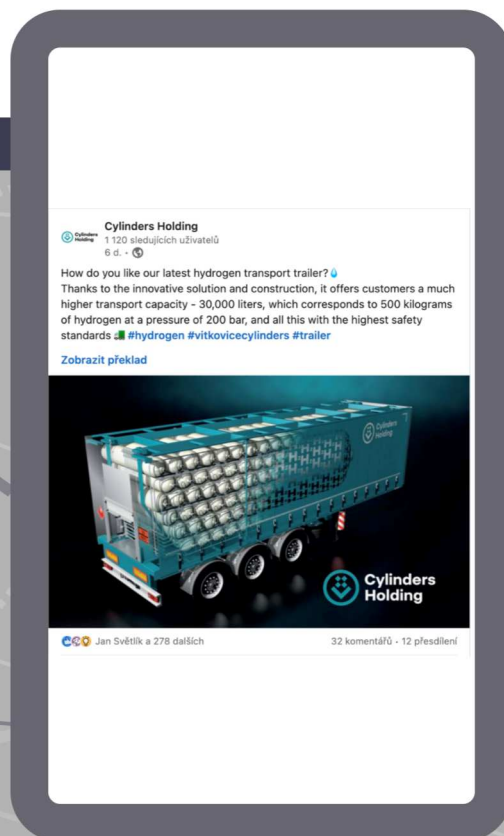
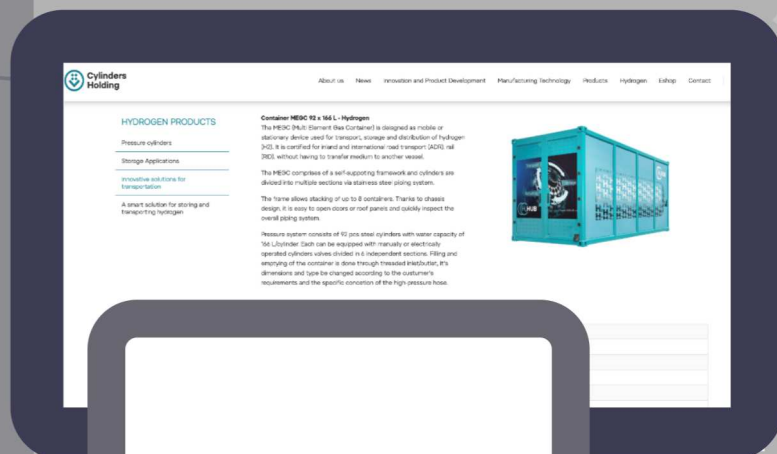
We are also planning to visit other events, however not as exhibitors. To name a few of the biggest ones, we will be present at Connecting Green Hydrogen – MENA in Dubai, Canadian Hydrogen Convention in Edmonton, World Hydrogen Summit in Rotterdam, World Hydrogen North America in Houston, Gastech in Singapore and Hydrogen Days 2023 in Prague. We will be happy to see you at any of these events. During these events, our colleagues will be present and open for discussions about any of the problems or hurdles that you may encounter when trying to deal with hydrogen and its supply. We are always open to hear your problems and try to find the best solution according to your specific needs.

**We hope to see you there!**

# 05

SOCIAL  
NETWORKS

# Stay informed...



**Cylinders  
Holding**