

# PBUCH S.A. THE FIRST QUARTER OF 2020

Newsletter Spring 2020

March 2020

## Any news?

In this issue of the Newsletter a bit about fuel containers, shell and tube heat exchangers for coal mining industry and petrochemical applications as well as for heat recovery installations in the chemical industry. Another hyperbaric chamber is behind us. Moreover we managed to make and certify the pressure vessel with the acceptance of the China Classification Society in these difficult times. We were also visited by inspectors of RINA, LRS, WDT, DNV / GL, PRS, TÜV, and it is just the third month of this year.

Today, in the shadow of the threat of an epidemic, we create our products with appropriate procedures, safety regulation, and on possible distance.

## Installations and modernisations on-board

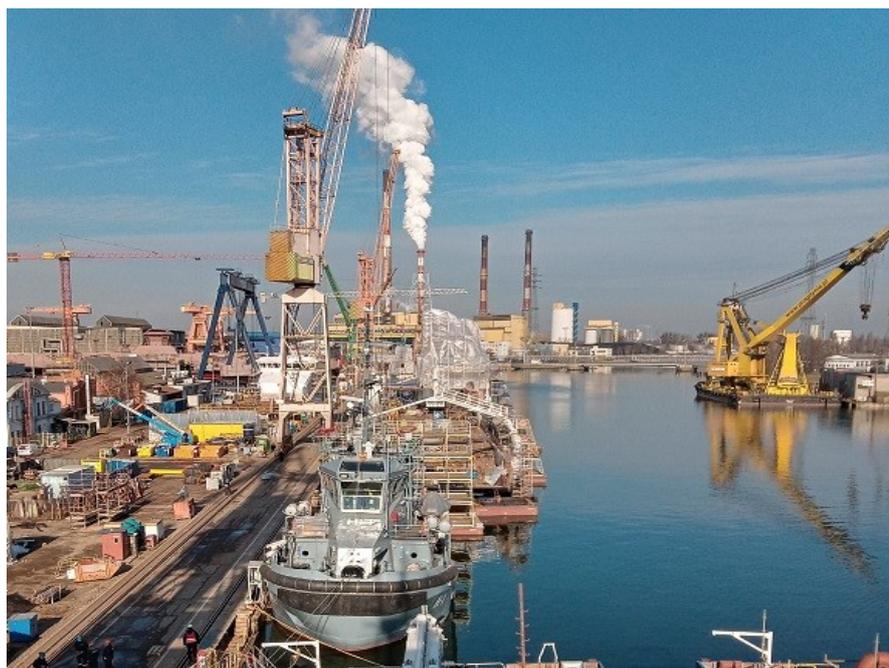
During commissioning are systems on multi-purpose vessels for the Maritime Office in Szczecin, we are completing installations on ORP Albatros and , as well as ORP Hydrograf, we finished the refrigeration system on M / V Skagerak - Research vessel for Göteborgs Universitet, but we also carried out services and repair works on Ro-Ro ferries: M / F Princess Anastasia, M / F European Seaway, M / F Barbara Krahulik, M / F Suecia Seaways, M / F Bretagne and M / F Wawel, on a trawler: Belomorje, on a cable vessel: Ile d ' Quessant, on S / Y Oceania — research vessel and on PSV units.

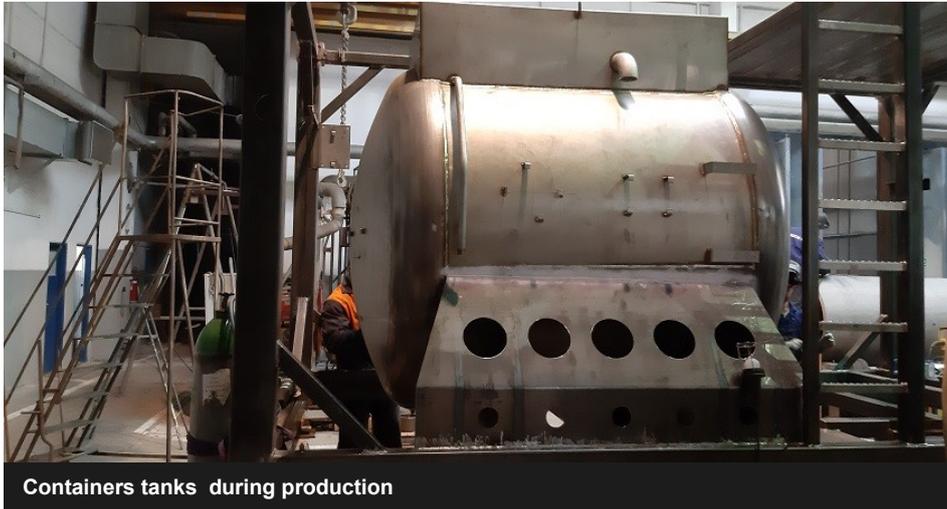
Emilia Węglewska, Trade and Marketing Department Manager



## In this issue:

- Heat exchangers for the petrochemical and dyeing industry
- Containers with ADR certificate
- Hyperbaric chamber
- Pressure vessels with the CCS Certificate
- Finite Element Analysis





Containers tanks during production

## Next double - walled tank

Project: Development of the Gilowice 3K well (PGNiG Technologie S.A.)

Order scope:

Double walled tank V-810 with coil for 11 bar pressure.

## Double - walled tanks for fuel containers

PBUCH produced set of tanks V=10130 L and V= 9000L for storage and handling of fuels on road, rail and sea. Containers consists of a tank body, a fuel pump system suitable for self-sufficient operation and integrated into ISO frame

Tank bodies were designed as a double-walled tanks with leak monitoring. They are equipped with tank heating system.

In combination with suitable mobility carriers (lorries with ADR approval and twist-lock and optionally with hook-lift system) containers are used to supply fuel to end consumers with compliance with all environmental requirements.

Containers can operate on mobile platform and in remote operation, as stand-alone devices and are able to refuel two consumers at the same time. An integrated generators ensures autonomous operation of the units. They are also suitable for global use in various climatic zones as well as having a robustness suitable to cope with harsh field operation.



Double—walled tank

## Requirements

CSC and IMDG certificates issued by PRS, ADR certification issued by TÜV

Frame of the container is equipped with:

- ladder and climbing aids
- mounting brackets
- two guide rails for lifting
- folding guard rail and slip-resistant walkway on the container roof
- brackets for two 6 kg fire extinguishers and
- documents storage compartment for operating instructions
- danger labels and warning sign holders



Double walled tank for fuel container

## U-tube bundle

A gas heater U-tube bundle was made for the production test of the Gilowice 3K well.

Technical data:

Test pressure: 63 bar

Temperatures: -29 /+120 °C

Medium: methane, brine

Thermal power: 3.66kW

Pipe material: P235GH

Tube plate material:  
P355NH



## Three phase separator

The separator is part of the installation used when performing maintenance on wells, mainly for:

- separation of reservoir fluids: gas, oil,
- measurements and control of well operation parameters,
- liquid separation after mining intensification operations.

The separator is intended for the separation of reservoir fluid into three phases: natural gas, crude oil and reservoir water. This is horizontal unit with an inside diameter of 1100mm and length of 3600mm. On the one side of the shell is an elliptical bottom and on the other DN600 inspection opening and manhole. It has been adapted for mounting a radar level transmitter, reflective level indicator, vibrating level indicator and for mounting thermometers.

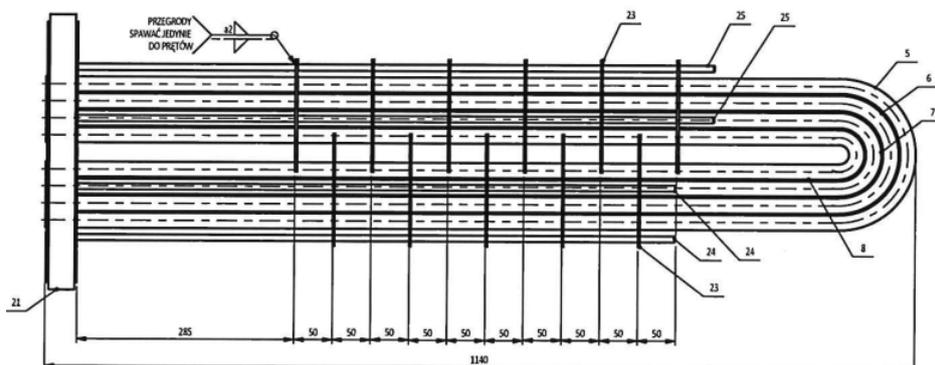
Inside the separator there are two perforated baffles regulating the flow, and one baffle protecting the decanter against excessive accumulation of solid fractions and an overflow partition.

Design pressure - 100 bar

Test pressure - 143 bar

Volume - 4000 l

The separator after welding was subjected to stress relief annealing.





Heat exchangers for heating oil and water

## Oils used in the heat exchangers

Oils for heat exchange systems are made of highly refined mineral oils resistant to thermal cracking and chemical oxidation.

They have good heat transfer efficiency and their viscosity allows them to be easily pumped both at start-up and at operating temperatures.

The ignition temperatures of these oils are not significantly reduced during operation due to their resistance to thermal cracking at operating temperatures for which they are recommended.

They have high thermal stability and can be used for a long time without causing sediment formation or viscosity increase.

They exhibit temperature properties and heat transfer coefficients that ensure faster heat dissipation.

The use of oils for heat exchange systems is recommended for both closed and open indirect heating and cooling systems used in various industrial processes.

## Repair of oil coolers

The subject of repair are oil coolers  $F = 31.7 \text{ m}^2$ . The coolers have been designed and tested in accordance with the requirements of Directive 2014/68 / EU and PN-EN 13445: 2014.

### Construction

The oil coolers are build of 140 pieces of 20x1 tubes made of X2CrNi18-9 stainless steel. The covers and tube plates are made of stainless steel: X5CrNi18-10 and X2CrNi19-11. Body with a diameter of  $\phi 406$  is made of steel P265GH. Process tubes are welded in tube plates and expanded to remove the gap between the opening in the tube plate and the process tube. The tube plates are welded to the shell. Oil coolers are equipped with a compensators.

The design pressure on the shell side is 10 bar (g) and on the tube side 8 bar (g). The total length of the heat exchangers is  $\sim 4687\text{mm}$ .

### Purpose of repair

As a result of the repair, will be restored the correct compensation of the thermal elongation of the coolers caused by the differences in process temperatures. The repair also aims to restore the protection of the coolers against possible unsealing of the compensator bellows.

### Authorisation

Based on the October 2018 decision, we are authorized to repair pressure and non-pressure tanks under the UDT Third Body classification.





Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006

Placing on the market prohibitions (...) [dates of prohibition]

11. Refrigerators and freezers for commercial use (hermetically sealed equipment

- that contain HFCs with GWP of 2500 or more – 1.01.2020

- that contain HFCs with GWP of 150 or more – 1.01.2022

12. Stationary refrigeration Equipment that contains, or whose functioning relies upon, HFCs with GWP of 2500 or more except Equipment intended for application designed to cool products to temperatures below  $-50^{\circ}\text{C}$  – 1.01.2020

13. Multipack centralised refrigeration systems for commercial use with rated capacity of 40kW or more that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 150 or more, except in the primary refrigerant circuit of cascade systems where fluorinated greenhouse gases with a GWP of less 1500 may be use – 1.01.2022

14. Movable room air-conditioning equipment (hermetically sealed equipment which is movable between rooms by the end user) that contains HFCs with GWP of 150 or more – 1.01.2020

15. Single split air-conditioning systems containing less than 3 kg of fluorinated greenhouse gases that contain, or whose



Cooling and freezing chamber

## Research project

We work on the research project entitled "Development of an innovative, ecological refrigeration equipment for ship applications" as part of the "INNOSHIP" Sectoral Operational Program.

At present we are continuing design and conceptual work, but also started purchasing process of components for the construction of the test station.

The cooling and freezing chambers were installed in a specially prepared room, as well as the supply switchboard and the ventilation of the station together with a gas detection system signalling unwanted leakage and automatically activating exhaust ventilation.

The test station is intended for:

- Conducting research on various concepts for the use of chillers / condensing units / air-conditioners, testing control variants and analysing the system in terms of capacity, achieved temperatures, convenience and reliability of work, which is particularly important on a ship, which is away from the service base for a long time.
- Performing functional tests of refrigeration devices by installing built-in aggregates into the refrigeration system and checking their operating parameters.
- Performing Factory Acceptance Tests (FAT), initial commissioning.
- Conducting training of personnel operating refrigeration installations, performing demonstrations for potential customers.
- Carrying out optimization works of refrigeration units in order to improve their operation and increase efficiency.



Hyperbaric chamber for Navy vessel „ORP Mewa”

## Decompression chamber for the Navy vessel „ORP Mewa”

In March 2020, we made and delivered next Decompression chamber for the Navy Vessel ORP "Mewa" („Seagull" ), the third in the series of Min destroyers.

### Vessel description

The ship was intended primarily for the search, classification and destruction of sea mines. There is also possibility to place them from the vessel. In the future, vessel will represent Poland during NATO military exercises and trainings.

The hull structure and quiet drive significantly increase the safety of the crew during combat operations. Currently used mines usually react to a sufficiently high magnetic field or sound intensity. While searching for them, the crew may use several sonars. The first was placed under the keel, the other two on the submarines Double Eagle Mk III and Hugin.

Detected mines can be eliminated in several ways. Two more types of underwater vehicles are used for this purpose. The remote-controlled vehicle puts explosive charges which detonates itself near a mine.



Shipment of the Decompression chamber to the Shipyard

## Decompression (diving)

Decompression is the process of removing gases accumulated in the diver's body when breathing in conditions of elevated pressure.

The gas most commonly used for breathing under water is air - a mixture of oxygen and nitrogen. As the diver's depth increases, this gas is fed by the regulator under increasing pressure, equal to the pressure of the surrounding water. In such conditions, there is an increase in the amount of nitrogen dissolved in the diver's blood and other body tissues.

If, as a result of a long or deep dive, a large amount of nitrogen is found in the diver's tissues, a direct ascent to the surface may cause the formation of nitrogen bubbles in the tissues, which can cause congestion, hypoxia of the body parts or tissue tear (so-called decompression sickness).

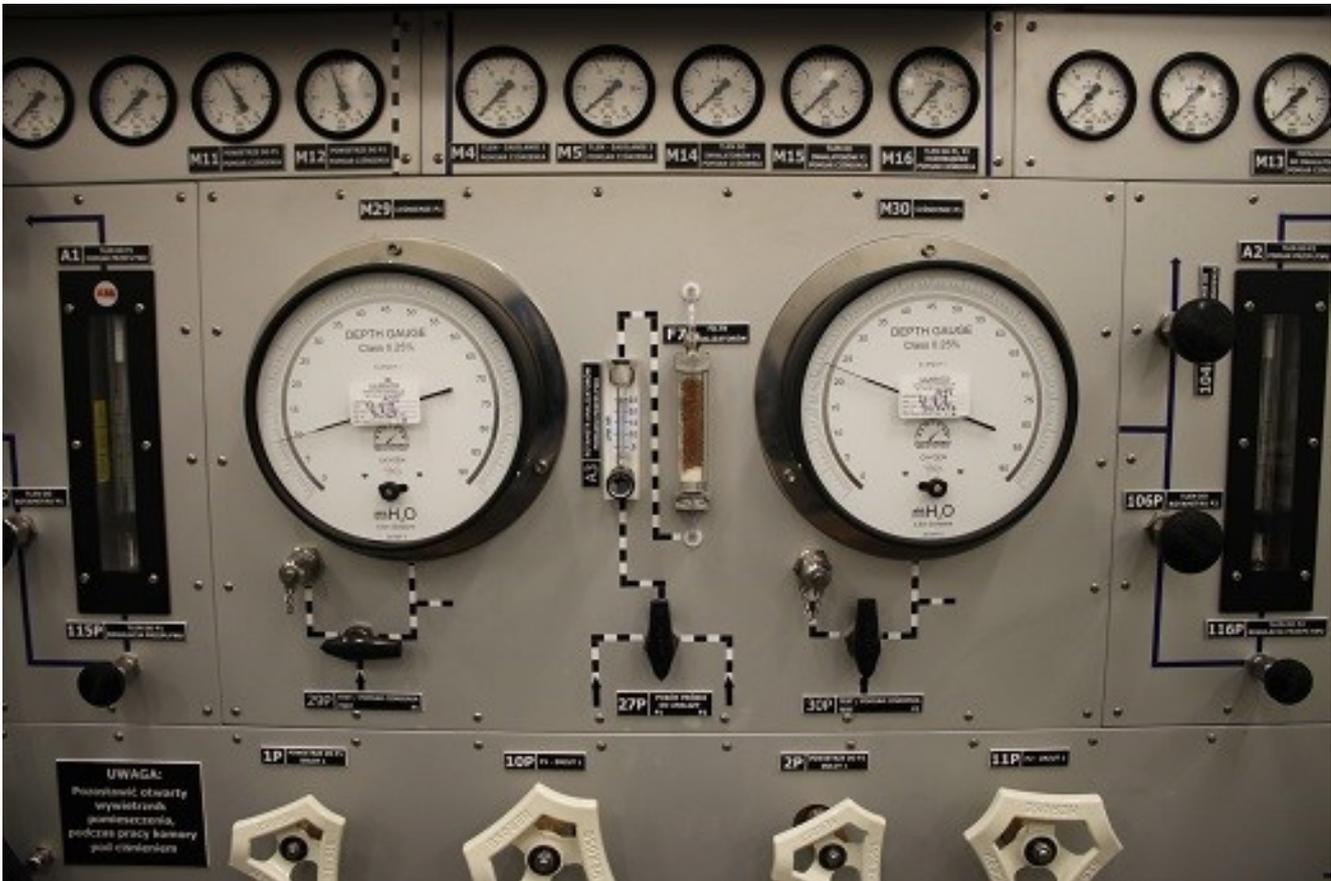
Symptoms may appear immediately after rapid decompression but also after years, e.g. in the form of bone fragility.

To prevent the negative effects of decompression, it is necessary to slow down the ascent so that the nitrogen accumulated in the blood is removed from the body during the breathing process. For this reason, decompression stops are performed with the help of decompression tables or a dive computer.

### Divers

On board of ORP "Mewa" there is also a place for specialized miner divers who have at their disposal the decompression chamber of our production.

Decompression chamber is used for hyperbaric therapy in case of decompression sickness.



Measuring system

## Hyperbaric chamber

The chamber equipment includes the following basic installations and systems:

- gas installation,
- life support system in the chamber (inlet and outlet installation manually controlled from the chamber service panel, oxygen dosing system, carbon dioxide absorbers, inhalation system (BIBS), chamber heaters maintaining a certain temperature),
- measuring system,
- electrical installation,
- fire-fighting equipment,

### Measuring system

The extensive measuring system is designed to control the atmosphere parameters of the chamber compartments and performs measurement of pressure, temperature, humidity as well as oxygen and carbon dioxide content. In addition, it allows measurements of other gases and harmful admixtures with additional instruments by taking gas samples directly from the chamber.





## Hyperbaric chamber - continued

### Respiratory agents

The hyperbaric chamber is adapted to the use of the following respiratory agents: air, oxygen and breathing mixtures, and also ensures the maintenance of the required partial pressures of the respiratory agents' components and constant control of their content in the chamber atmosphere.

### Equipment

The interior of the hyperbaric chamber is equipped with: 2 beds, for 2 lying persons or 8 people sitting and 6 folding seats, of which 4 are in the transfer compartment. A total of 14 inhalers were installed in the chamber, as well as 3 carbon dioxide absorbers, 2 hyperbaric fire extinguishers and heaters.

The container is also equipped with lighting system and emergency lighting. The interior of the chamber is illuminated by means of LED lamps.

### Construction

The compartments of the chamber are separated from each other by a pressure bulkhead in which a transition manhole is mounted. At both ends of the chamber there are main hatches equipped with connections according to NATO STANAG 1079 FLANGE standard used by NATO. The internal diameter of all manholes is Ø750 mm, which allows free passage.

In addition, the chamber is equipped with two transport locks (one for each compartment) and 11 portholes, of which 2 are equipped with monitoring cameras. Diving phones, pressure gauges and the necessary fittings are also installed in both interiors.

### Gas installation

The gas installation is designed for storing respiratory factors, sending them to the chamber, discharge from the chamber and measuring their pressure and composition. The basic elements of the gas installation were selected based on the requirements for the safety and comfort of people being at elevated pressure. All system components have been prepared and assembled taking into account strict requirements for oxygen purity.

## Life support system in the chamber - BIBS chamber inhaler

Exhaust manifold

Inhaler reducer

Inspiration collector

Inspiratory hose quick coupler

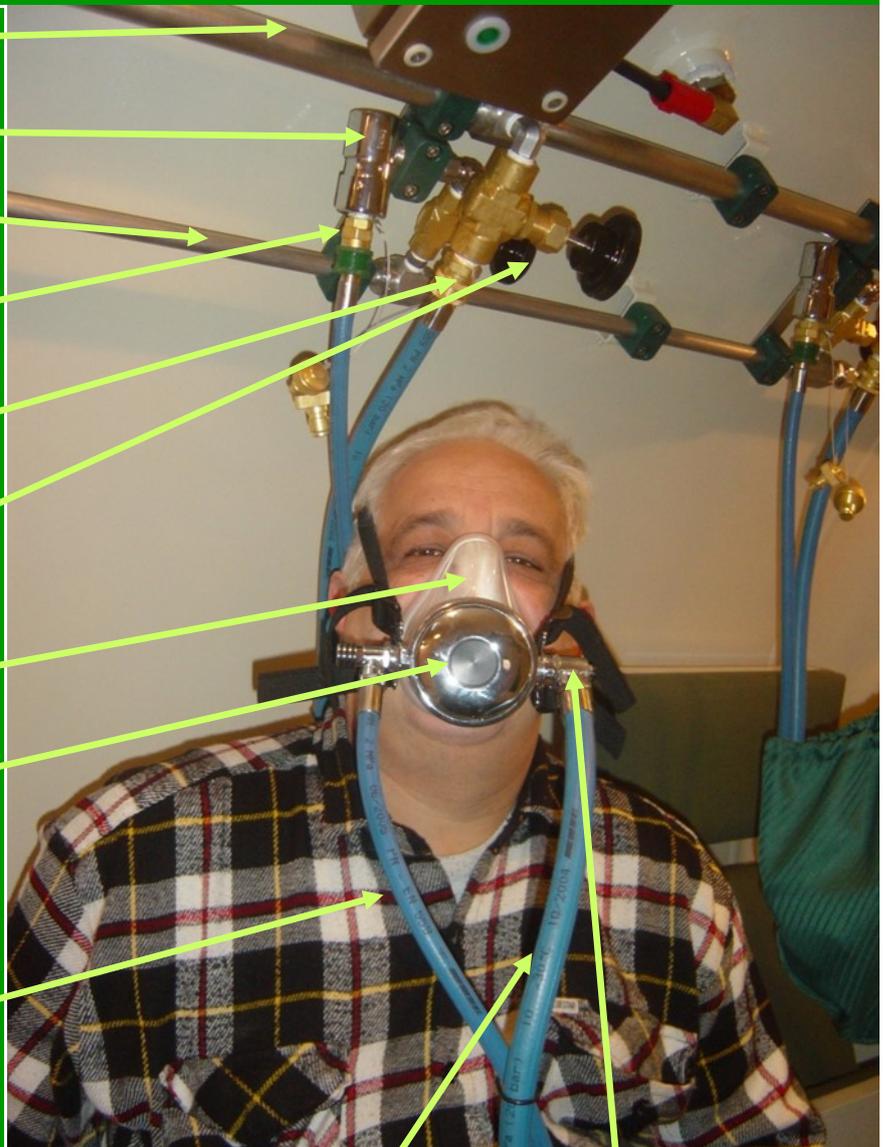
Exhaust hose quick coupler

Inspiration shut-off valve

Respirator

Inhaler machine

Inspiratory hose



Exhalation valve

Exhaust hose

The **BIBS installation** as part of the life support system is intended to allow breathing for persons in the chamber in cases where it is not possible to breathe directly from the atmosphere of the chamber. The installation allows exhaled gases to be removed outside the chamber. This protects against exhaust gas pollution of the chamber atmosphere.



## Standard 3834 implemented

Welding is considered a special process. This means that the final non-destructive testing of welds does not fully confirm whether the product quality specified in the standards has been achieved. Unfortunately, not all construction materials have good weldability. Therefore, this process is required to be carried out in an effective manner and under proper supervision. Due to the fact that in our activity welding is used to manufacture responsible industrial products, it was decided to confirm compliance with the requirements of PN-EN ISO 3834-2 by the certification body. This unit is the Polish Register of Shipping. The mentioned standard

concerns welding quality systems, however, it is not a quality management standard that replaces ISO 9001, but supplementing ISO 9001 with the welding process.

## Parts of 3834 standard

The PN-EN ISO 3834 consists of the following parts, under the general title Quality requirements for fusion welding of metallic materials:

PN-EN ISO 3834-1 Criteria for the selection of the appropriate level of quality requirements ,

- PN-EN ISO 3834-2 Comprehensive quality requirements

- PN-EN ISO 3834-3 - Standard quality requirements
- PN-EN ISO 3834-4 - Elementary quality requirements
- PN-EN ISO 3834-5 - Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2, ISO 3834-3 or ISO 3834-4
- Sixth part (PN-EN ISO 3834-6), presents guidance on implementing ISO 3834 .



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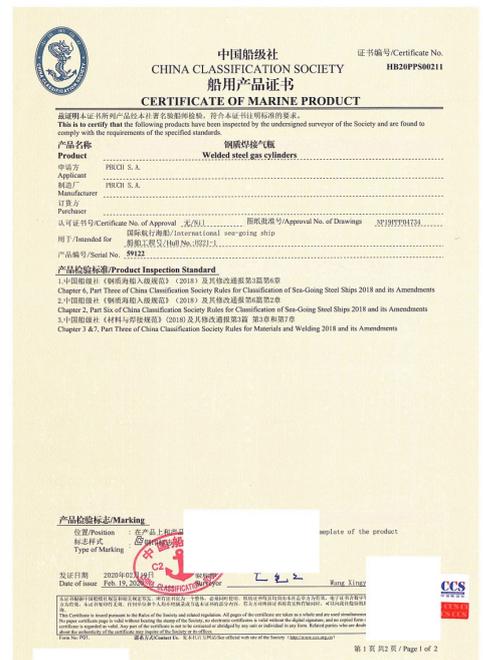
Zbiornik CO2 z certyfikatem China Classification Society

## CO2 pressure vessel with CCS acceptance

We manufacture tanks for low-pressure fire protection systems, dedicated to large cargo spaces on ships, to protect the transported goods.

The advantage of this system is that one tank eliminates the need to mount the amount of high pressure CO2 cylinders by reducing the weight of the fire extinguishing system by 50%.

The design of the tank and its frame also supports the CO2 cooling system, refrigerant distribution system, control system, measuring system and safety valves. The order includes the production of a pressure vessel, distribution system components and insulation. Tank insulation is performed in such a way as to ensure control of full protection of the tank surface with polyurethane foam. The foam is injected under the temporary coat, then it is removed, any deficiencies are filled up and after verification the correct coat made of aluminum sheet is built on.



The scope of supply of the tank includes preparation of design, concession documentation, approval of documentation in the Class, carrying out the production process in accordance with the requirements of the Third Body and the client.

In January 2020, we made, among others tank of this type with the acceptance of the Chinese Classification Society. The documentation was approved by the headquarters in China. The production process was carried out under the supervision of inspector from Hamburg office.



## Attenuator tank

Attenuator tanks are one of the types of air receivers produced in our factory for many years.

We also offer air receivers for air starting systems used on ships as well as for pneumatic installations.

## Shell and tube heat exchangers for coal mines

Condensers manufactured by PBUCH S.A. are used in a variety of refrigeration systems where seawater or contaminated water are condenser's cooling medium, as it is on ships or in cooling systems in mines.

### Another set

In January 2020, we delivered a series of condensers used in mine cooling units.

The condenser tube bundles are made of low-finned copper (Cu) or copper-nickel (CuNi) pipes, which on the one hand ensures high heat transfer coefficient and on the other hand resistance to the effects of the cooling medium.

We offer condensers with a bimetallic or titanium tubes for ammonia refrigeration systems.

The tube plate and condenser covers are protected against corrosive influence of the cooling medium by a special polyamide coating.



Shell and tube condensers for coal mines



Stainless steel tanks for waste storage

## Stainless steel

Stainless steel is a term used for parts of quality steel grades containing chromium - at least 11% - which ensures their corrosion resistance.

This means that such material does not deteriorate either under the influence of chemical or electrochemical reaction with the surrounding environment.

The reasons for corrosion resistance of stainless steel should be seen in the high content of chromium, which by entering into a chemical reaction with oxygen, forms on the surface invisible to the naked eye a layer of protective chromium oxide and iron. The result is a comprehensive 'shield' against acid substances, which also rebuilds in the event of mechanical damage.

## Production of high-grade steel products

We specialize in the production of low-temperature steel products, NACE-certified steel as well as products made of stainless steel AISI 316L, 316Ti, 304 and 321.

Stainless steel is an inseparable companion of various industries - from energy production, through building constructions, medical devices, to chemical, transport or food production. Due to the high practicality of the material, elements made of stainless steel can be found in newer and newer places.

Over the past three months, we have made a number of high-grade steel products, including:

- Container fuel tanks
- Storage tanks
- Tube bundle
- Oil-water heat exchanger
- Hyperbaric chamber
- Attenuator tank

# CO2 Separator

For the ammonia-CO2 cascade system, we produced tank dedicated to the trawler's cooling system. Clue in the fact that the said tank was to work as:

## Hanging tank

The construction of the tank structure required its recalculation taking into account not only its own weight but also the dynamic loads caused by the ship's movements.



CO2 Separator - hanging construction - calculated with FEA method

## FEA calculations

If it is required, we offer calculations using the Finite Element Analysis, ensuring full security of use of the manufactured structure or product.

The Finite Element Analysis (FEA) method is today one of the basic methods of conducting computer-aided engineering calculations (CAE - Computer Aided Engineering).

It is an advanced method of solving systems of differential equations, based on the division of the domain (so-called discretization) into finite elements for which the solution is approximated by specific functions, and carrying out actual calculations only for the nodes of this division.



***Happy Easter  
Health, good luck and perseverance***

***Wishes the whole team of PBUCH S.A.***

## Contact Us

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