



A Supplier of High Pressure  
Alkaline Electrolysers



# Introduction

HydrogenPro, together with partners in China and USA, deliver alkaline electrolyzers splitting water into hydrogen and oxygen gas. Our team has long experience in electrolyser technology and we are in total more than 100 employees.

Our pressurized alkaline electrolyzers has been delivered since 1994 and more than 300 plants have been installed worldwide. We are using high quality components and our production unit is certified according to ISO 9001. All our products are produced with maximum focus on safety, reliability and long lifetime with minimum cost.

All our electrolyzers are pressurized hence you can also utilize the oxygen gas for industrial application without investing in expensive compressors.

Our electrolyzers have been delivered for use in float glass, chemical, electronic, metallurgical, optical fiber and oil & grease industries. Our electrolyzers have also been delivered to gas companies and thermo and nuclear power plants.

We guarantee you a high quality product to a very competitive price!

## **Please contact us at:**

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*Electrolyzer cellblock where pipes are color marked according to the type of fluid, see next page for the belonging gas separator skid.*

# Products

## Product range:

Our electrolyzers can be ordered in any capacity from 2 Nm<sup>3</sup>/h of hydrogen production up to 600 Nm<sup>3</sup>/h as a single cellblock. If hydrogen is required in volumes more than 600 Nm<sup>3</sup>/h, several cellblock can be connected together. Pressure up to 50 bars without compressor.

## Units we supply:

To complete your electrolyser plant, we can also deliver:

- High voltage transformers
- Rectifiers – with water cooled thyristors
- Feed water tanks in stainless steel – where N<sub>2</sub> stripping can be included
- Lye mixing tanks in stainless steel – including lye mixing pumps
- Buffer tanks – all sizes
- Oxygen purifiers – with up to 99,9999 % pure oxygen
- Hydrogen purifiers – with up to 99,9999 % pure hydrogen
- Water treatment systems – for feed water supply
- Gas detectors and analysers

## Services:

If required, we can offer engineering, technical support and commissioning of the electrolyser plant. We can also enter into service agreements.



*The gas separation skids with lye pumps and coolers.*

# Technical information

## Medium size and large units:

If you require an electrolyser producing between 100 and 600 Nm<sup>3</sup>/h, the electrolyser cellblock and the gas separation skid arrive site as two separate and complete units. They only piping needed to connect them together, are the lye pipes and gas pipes. In addition, feed water, cooling water, instrument air and N<sub>2</sub> will be connected to the gas separator skid.

## Small size units:

If you require hydrogen gas in the amount between 2 and 100 Nm<sup>3</sup>/h, then the electrolyser plant can be delivered as one compact unit, either in a cabinet or in a container.

## For all sizes of electrolyser plants:

- All the electrolysers are very compact units and require very little floor space
- Oxygen gas and hydrogen gas exiting the electrolyser hold a purity of approx. 99,5 % for the O<sub>2</sub> and approx. 99,9 % for the H<sub>2</sub>
- The gases exit under pressure (up to 20 bars for the large units and up to 50 bars for the smaller units)
- The temperature of the gases is about 40 degree C when they exit the gas separation skid
- Gas purity can be up to 99,9999 % if purifiers are installed
- All electrolysis plants can be remotely operated
- Easy start and stop. If the plant has been stopped for 1 – 2 hours, startup takes 1 second. If the plant has been stopped for one week, start takes 20 minutes before full efficiency
- The plants are normally running in automatic mode and the load normally varies from 25 % to 100 % output

## Table:

The table below shows a few selected sizes of electrolysers and gives an overview regarding floor space required for the installation. The pressure given is the maximum pressure of the gases exiting the electrolyser plant without installing compressors. Oxygen exit the electrolyser plant with same pressure as the hydrogen, hence Oxygen can also be utilized in most industrial application without compressor.

Hydrogen production in Nm <sup>3</sup> /h (kg/h)	10 (0,9)	60 (5,4)	125 (11,3)	350 (31,5)	600 (54)
Oxygen production in Nm <sup>3</sup> /h (kg/h)	5 (7,2)	30 (42,9)	62,5 (89,4)	175 (250,3)	300 (429)
Pressure without compressor in MPa (bar)	5,0 (50)	5,0 (50)	3,0 (30)	3,0 (30)	2,0 (20)
Total power consumption (kWh/Nm <sup>3</sup> H <sub>2</sub> )*	5,3	5,0	4,9	4,8	4,7
Approx floor space needed (m <sup>2</sup> )	20	50	70	100	125
Approx heigth to ceiling (m)	4	5	5	6	7

*\*Please note the Power Consumption in table 1 is given in AC power consumption. This include the energy consumption in the complete plant. Some producers give Power Consumption in DC, which means the power consumption in the electrolyser cellblock only.*



# Advantages

## Technical advantages:

The modern compact high pressure electrolyzers have the following advantages:

- A very compact solution, less than ½ floor space required compared to Atm electrolyzers
- The low energy consumption is stable during the lifetime of the cell stack
- Long lifetimes, cell stack normally 10 years other units more than 20 years
- Pressure up to 50 bars without compressor
- Capacity from 2 up to 600 Nm<sup>3</sup>/h in one cell stack
- Very little maintenance required since there are no moving parts (except lye pumps)
- Automatic operation, can be remotely controlled
- Quickly adjustable between 25 % and 100 % load



*2 electrolyzers and gas separator skids where cooling water enter (and exit) the gas separator from the trench in the floor.*

# Power Consumption

## Power consumption and operating cost:

One very important factor for an electrolyser plant is the operating cost. It is important to understand the difference between the DC and the AC power consumption. In the picture below you can read both the AC power consumption and the DC power consumption as a function of the %-load the electrolyzers are working under.

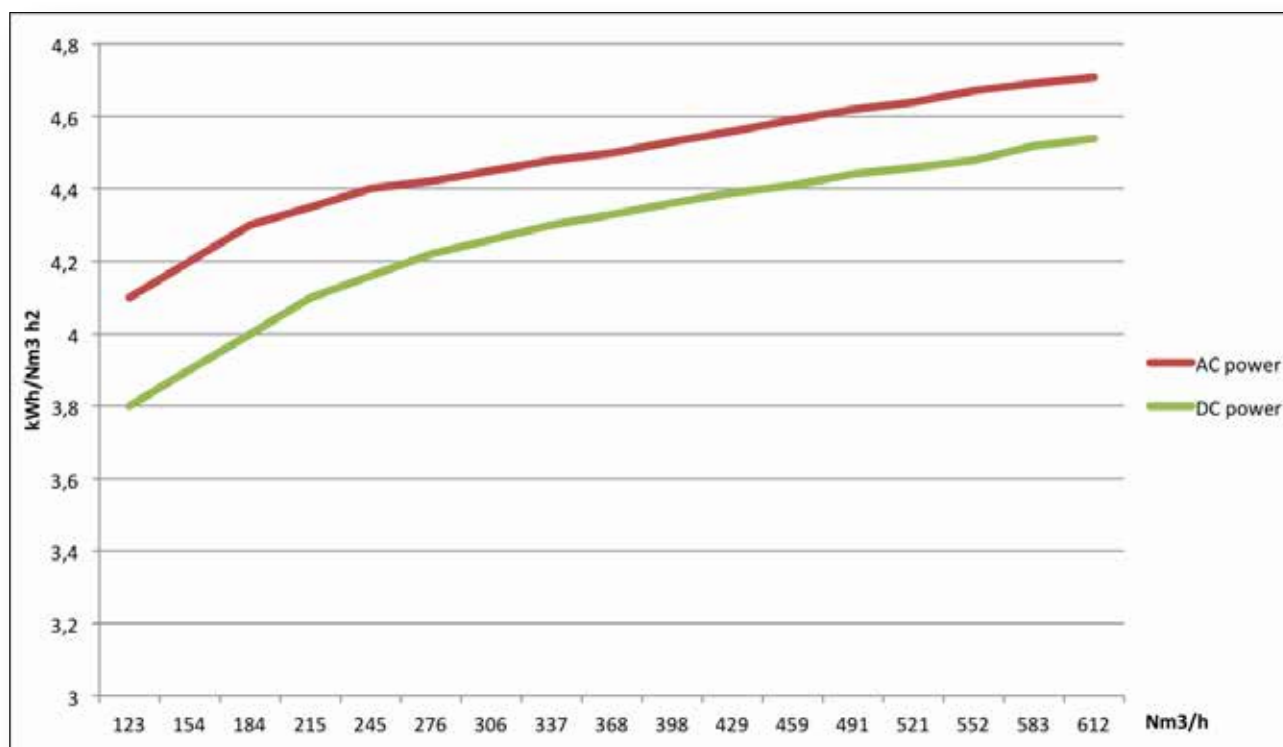
Another important factor is how the power consumption changes over time. The power consumption in all our presurised electrolyzers are **stable during the life time** of the units.

The electrolyser plant itself will last for many years, and the only component that needs to be replaced is the cell block. Therefore, in comparing units, it is important too look at the life time for the cell block as well as the power consumption over time. Our cell blocks are **good for 10 years** or more.

A part of the total cost is also the civil work to be done before the electrolyser plant is installed. Our very **compact solution will save you money** compared to for example atmospheric electrolyzers.

Since our plants can be **remotely operated** you will also save manpower during operation.

For most industrial applications, we **do not need any compressor** due to our high output pressure. This save service and electricity and reduce noise which may be important in some locations.



The two graphs shows average power consumption for a 600 Nm³/h electrolyser plant operating between 20 % and 103 %. The output has been adjusted to 612 Nm³/h to make sure the user have at least 600 Nm³/h available in the process.

# Compact solution

## **Small electrolyser:**

Small compact electrolysers can be delivered in cabinets or containers.

For sizes 10 Nm<sup>3</sup>/h and less we can also deliver PEM electrolysers.



*A cabinet mounted compact unit ready to be shipped to customer.*



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