

We perform  
under pressure.

ISO 9001:2015 CERTIFIED QUALITY MANAGEMENT SYSTEM

DIAPHRAGM COMPRESSORS

SIMPLEFUEL STATIONS

HYDROGEN REFUELING STATIONS (HRS)



## Our Solution: UPTIME

**THAT'S WHAT OUR CUSTOMERS DEMAND. THAT'S WHAT WE DELIVER.**

Meet PDC Machines. We are an equipment manufacturer in Eastern Pennsylvania, USA serving the hydrogen energy and industrial gas markets. Since 1977, our products have been synonymous with heavy duty operation, rugged design, and extended uptime for station reliability around the world. Our solutions are based on these three staples:

### ***We perform under pressure.***

#### DIAPHRAGM COMPRESSORS

Complete skids with automated controls and instrumentation.

#### SIMPLEFUEL STATIONS

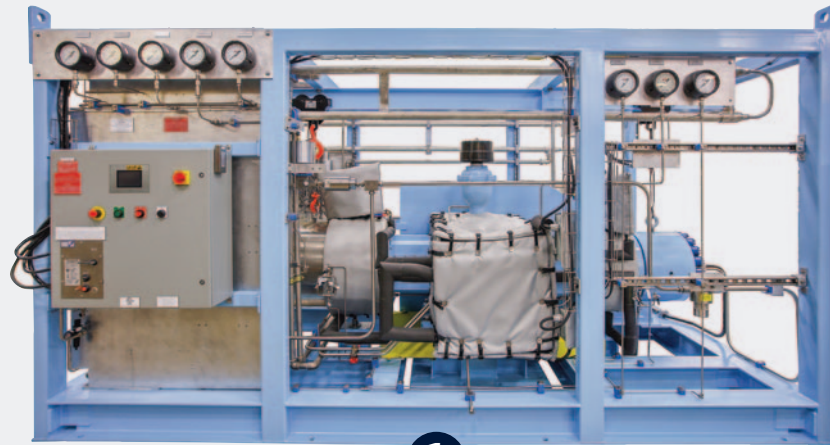
Production, compression, storage, dispensing.  
Small package. Small setbacks.

#### HYDROGEN REFUELING STATIONS (HRS)

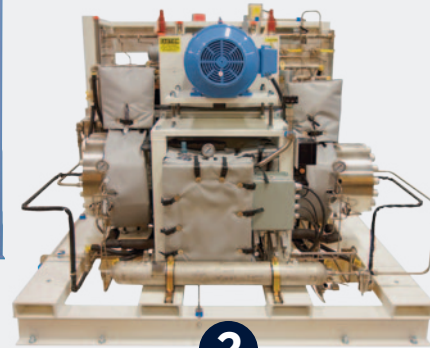
Designed and configured for your vehicle fleet's fueling profile.

# DIAPHRAGM COMPRESSOR

## PRODUCT FAMILY



1



2



3



4

- 4 different size cranks and associated heads
- All handle suction pressure down to ambient and discharge up to 1000 bar
- Greater flow capacity with crank size, rod load, and head diameter

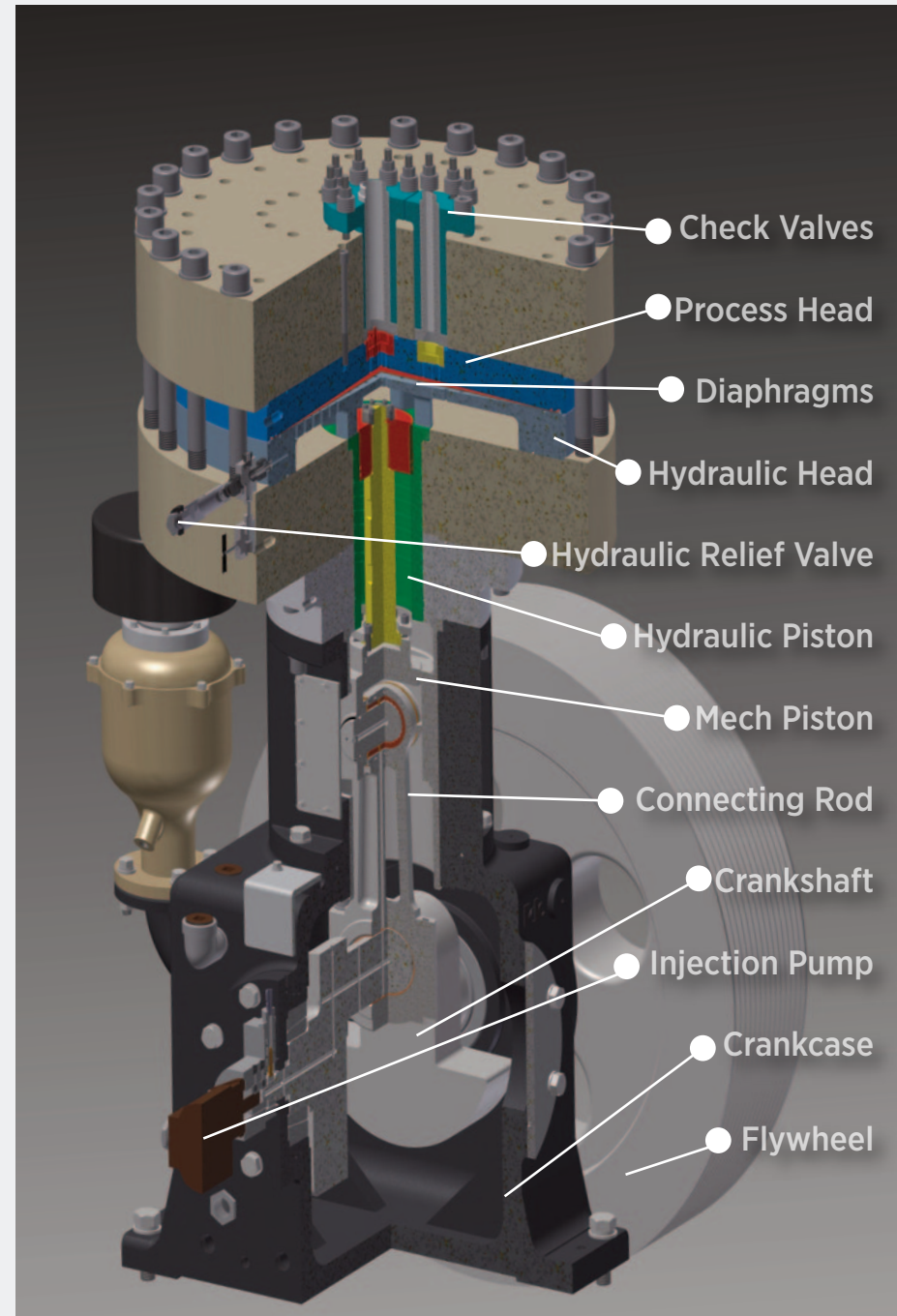
Example: H<sub>2</sub> gas, 30 bar in, 500 bar out

**1 PDC-13 — 1000 kg/day**  
15' L x 8' W

**2 PDC-4(150) — 70 kg/day**  
6.5' L x 6.5' W

**3 PDC-4(100) — 115 kg/day**  
6' L x 6' W

**4 PDC-3 — 50 kg/day**  
3' L x 3' W



POSITIVE DISPLACEMENT MACHINE

### HYDRAULIC SYSTEM

- Crankshaft driven by electric motor
- Reciprocating piston
- Hydraulic piston energizes compression

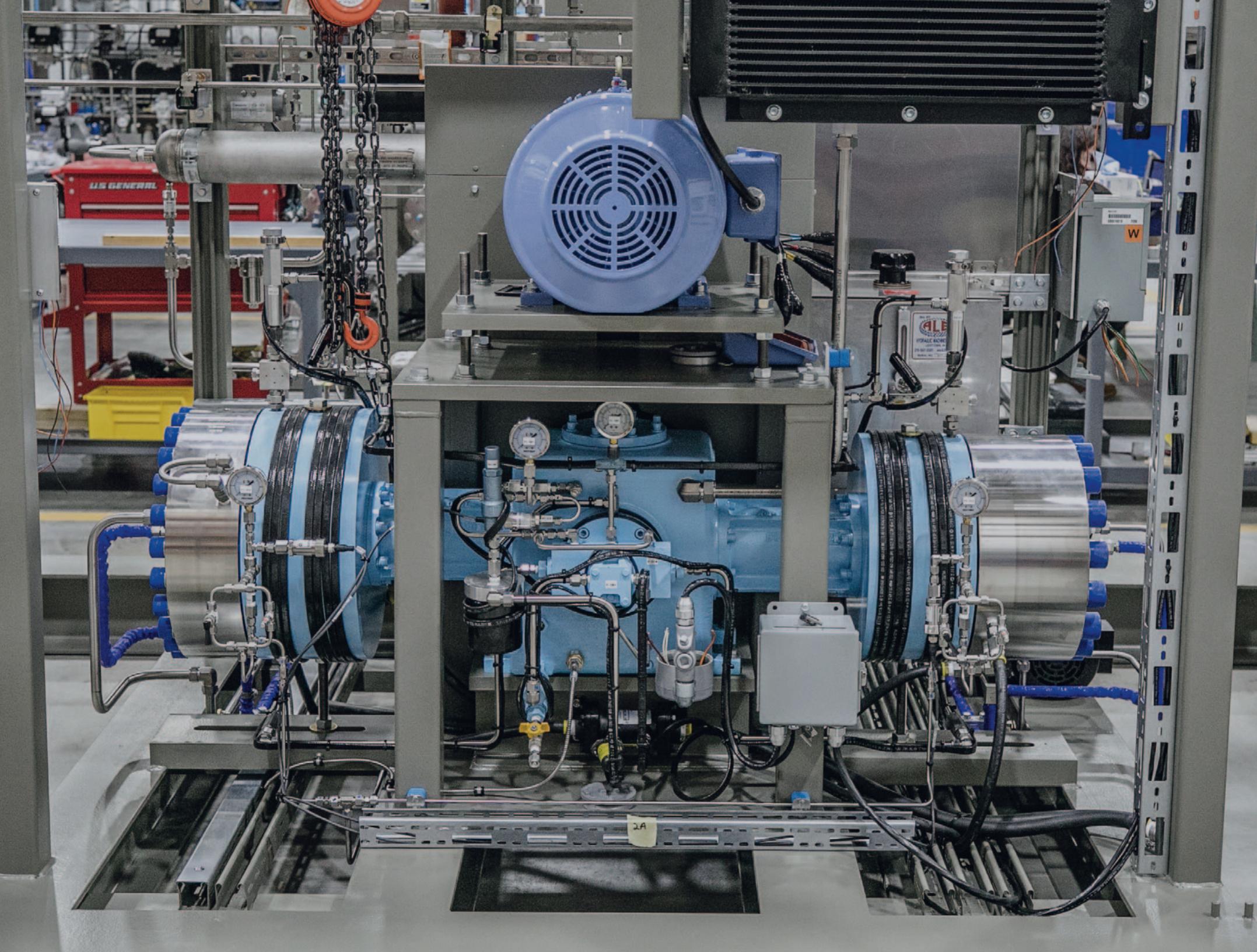
### COMPRESSION SYSTEM

- Gas head assembly
- Three diaphragms
- Check valves

### DIFFERENTIATORS

- Non-contaminating (oil separated from H<sub>2</sub>)
- Leak-free
- Energy efficiency (no dynamic seals)
- Low maintenance

WHAT IS A DIAPHRAGM COMPRESSOR



**VERY HIGH DISCHARGE PRESSURES**

Up to 1034 bar (15,000 PSI)

**NON-CONTAMINATING COMPRESSION**

Diaphragm leak detection system

**MAXIMUM UPTIME**

Reliable operation

**ENVIRONMENTALLY SAFE**

Leak-free

**INDUSTRY-LEADING ENERGY EFFICIENCY**

Low energy costs

**LOW MAINTENANCE COSTS**

4,000 to 8,000 hr head maintenance intervals

**FLEXIBLE OPERATION**

Variable Suction Pressure

**LONG TERM PERFORMANCE**

20+ year life

WHY DIAPHRAGM



PDC Machines shipped a PDC-13 compressor to support an upcoming transfill station in Northern California. This compressor solves problems with continuity of supply in early hydrogen refueling station rollout.

This 2-stage compressor will boost 1500 kg/day of hydrogen to 500 bar within a 15' x 8.5' footprint. This turnkey solution includes compression, controls, instrumentation, safeties, pressure vessels, and integrated cooling for autonomous operation.

**H2 STORAGE**

4.8 kg  
2-hr firewall

**H2 VALVE PANEL**

Flow control

**CONTROL PANEL**

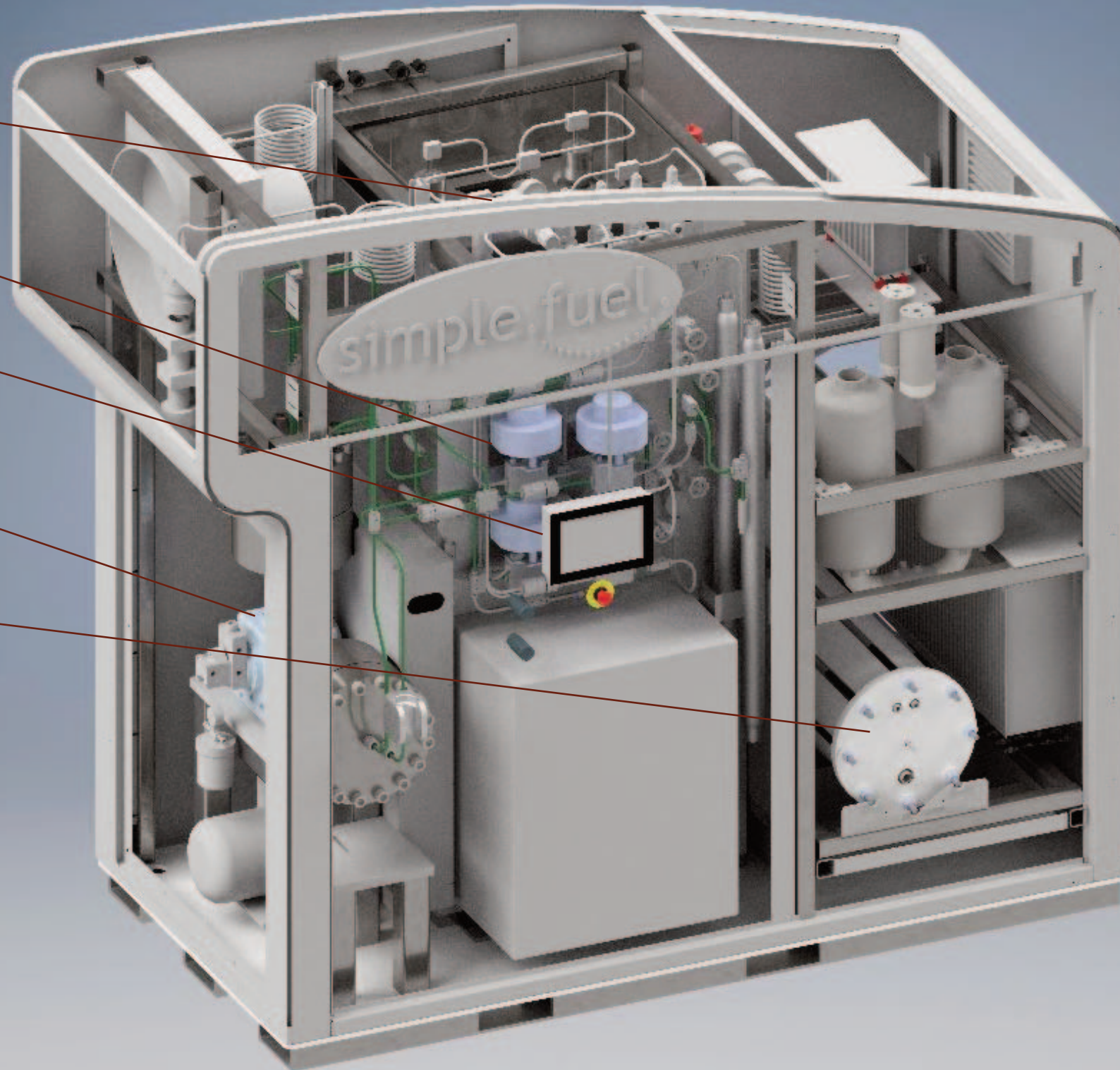
PLC  
Remote monitoring

**COMPRESSOR**

H2 to 350-700 bar

**ELECTROLYZER STACK**

20 kg/day



simple.fuel.®

*your on-site hydrogen fueling solution*

**MINIMAL SETBACKS**

Adjacent to building

**MOVED EASILY**

Plug and play

**STANDARDIZED PRODUCT**

NFPA (US)  
IECEX (Australia)  
PED/ATEX/CE (Europe)  
KHK (Japan)

**SIMPLIFIED PERMITTING**

Factory 3rd party cert

WHAT IS SIMPLIFUEL

## AFFORDABLE HYDROGEN FOR SMALL SCALE APPLICATIONS

### PROBLEM

At low volume, traditional H<sub>2</sub> supply methods are very expensive (ex. tube trailer / dispenser)

### IMPACT

Small operations do not have affordable options to enable fuel cell usage  
Forklift fleets (20 trucks)  
Small car fleets (10-20 cars)

### SOLUTION

Scalable for evolving demand  
10-20 kg/day  
Drop-in installation, small footprint



Photo Credit: Toyota Industries Corporation (TICO) Takahama Factory, Aichi Prefecture, Japan

WHY SIMPLE FUEL



**Customer:**

Toyota Industries Corporation (TICO)

**Location:**

Takahama Factory, Aichi Prefecture, Japan

**Application:**

Hydrogen fueling for forklifts in parts distribution center

Photo Credit: Toyota Industries Corporation (TICO) Takahama Factory, Aichi Prefecture, Japan

SIMPLE FUEL IN ACTION



# WHY HRS

Our HRS is made up of compression, storage, chilling dispenser, safeties, controls and factory certification.

## CUSTOMIZABLE

Designed and configured for your specific vehicle fleet

## SCALABLE

Grows with your fleet's future needs

## ADAPTABLE

Accepts any source of hydrogen (electrolyzer, tube trailer, reformer, etc)

## RANGE OF DISPENSING PERFORMANCE

350 bar Medium Duty/Heavy Duty or 700 bar Light Duty  
T20, T40 fills per SAE J2601 fueling protocol

## ADVANCED CONTROLS

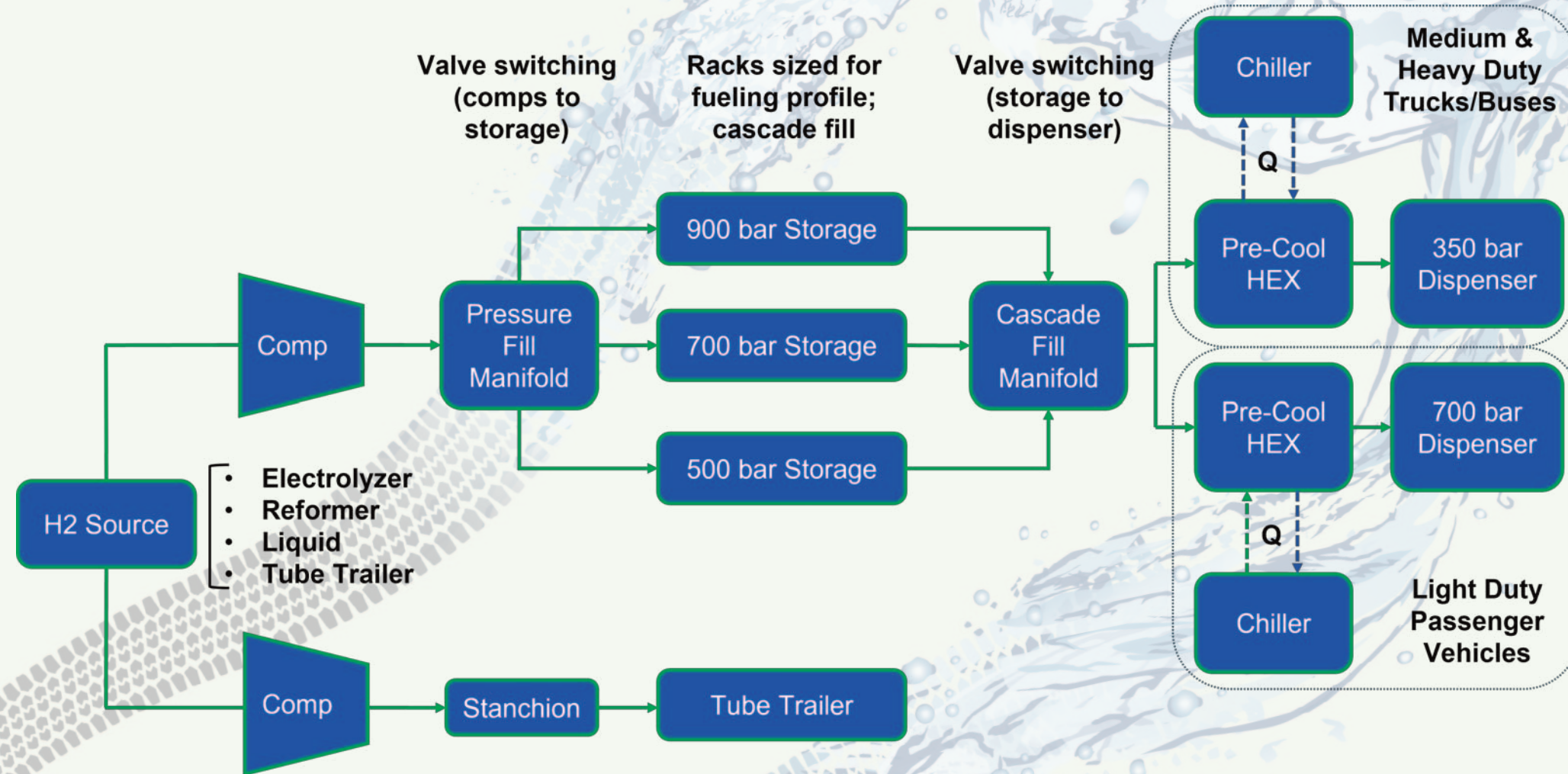
Remote monitoring and diagnostics  
Complete controls for autonomous operation

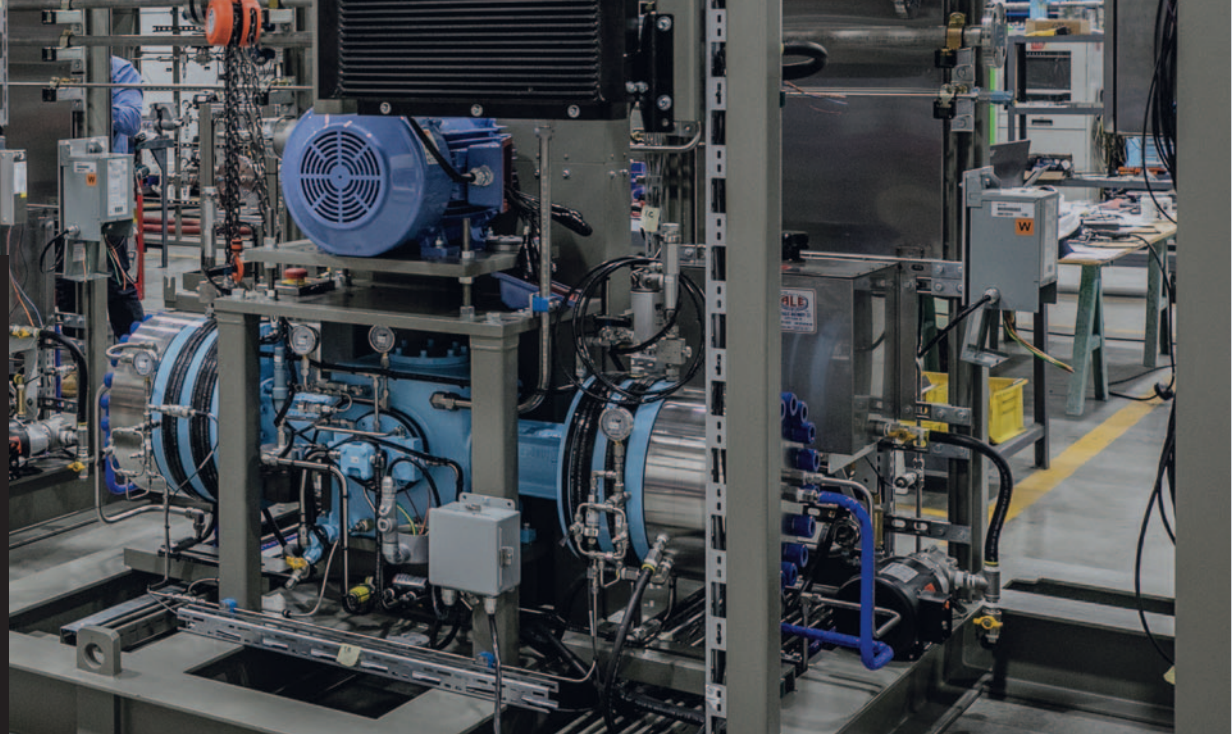
## COMPREHENSIVE SAFETIES

IR detectors, head detectors, flammable gas detectors, and PSV

## EXPEDITES PERMITTING

Factory certification to local codes and standards





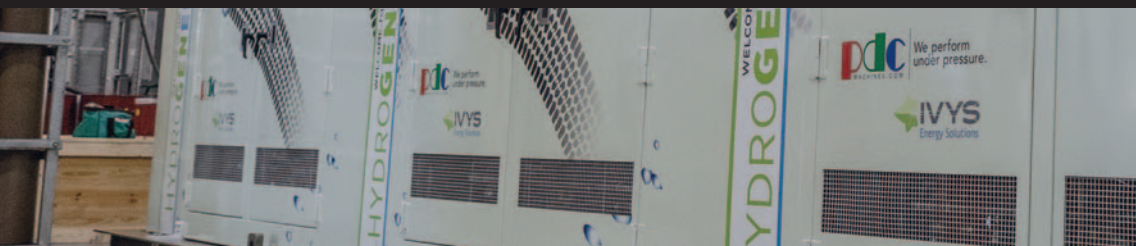
### CHAMPAIGN-URBANA MASS TRANSIT DISTRICT (CUMTD)

PDC Machines and Ivys Energy Solutions are deploying a Hydrogen Refueling Station at the Champaign-Urbana Mass Transit District (CUMTD) in Illinois.

This MW scale hydrogen station will fuel a fleet of twelve New Flyer 60' zero-emission fuel cell electric buses. The hydrogen infrastructure solution includes compression, storage, chilling, dispensing, safeties, and controls.

PDC and Ivys designed and manufactured the HRS to efficiently phase in buses. In Phase 3, all twelve buses will each be fueled with 35 kg back to back within 14 minutes per fill.

This very aggressive fueling profile results in 420 kg of total dispensed hydrogen within a 3 hour period. The HRS takes hydrogen produced from a MW-scale PEM electrolyzer and dispenses to the buses at 350 bar pressure at -20 degrees C temperature for a T20 fast fill. Additionally, the modular HRS design allows for future growth.

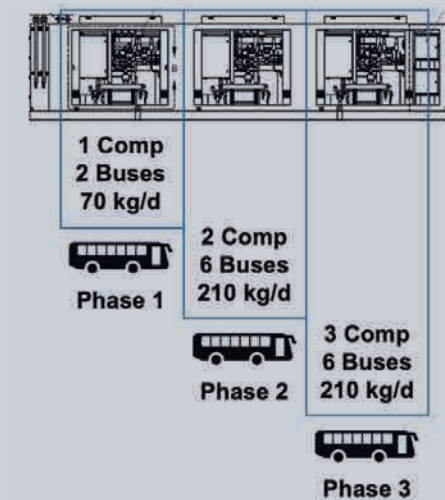


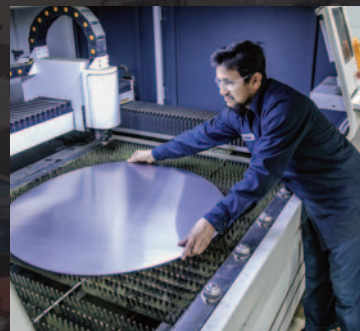
### FAST FILLS

12 buses in 3 hours  
35 kg in 10-14 mins

### GROW WITH BUS FLEET

Phased approach  
Redundancy on common skid  
Scaling with efficiency





## BACKGROUND

Founded 1977

2nd generation, family-owned

Local sourcing

## MANUFACTURING

90,000 sq. ft., > 20 CNC

ISO 9001:2015 certified

## SERVICE

Best-in-class global field service

Inventory / overnight parts ship

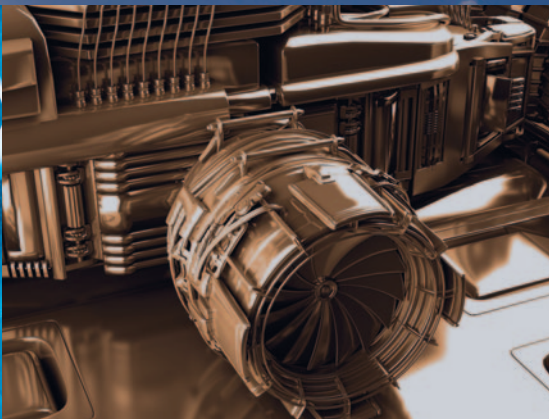
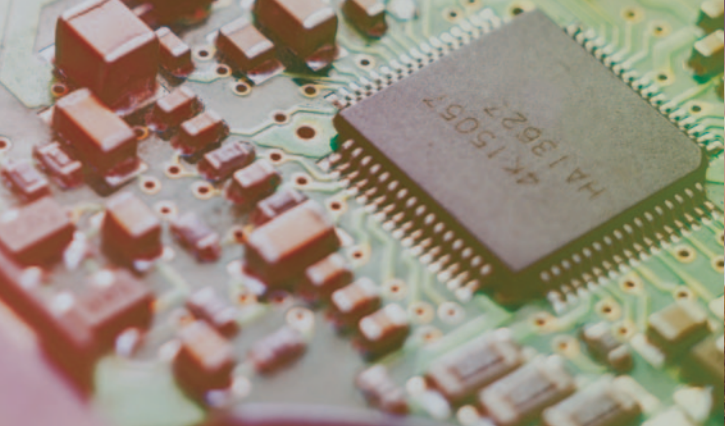
## EXPERIENCE

> 4700 compressors installed

> 500 for H2 energy

> 50 HRS

WHO WE ARE



## **HYDROGEN ENERGY**

Mobility stations for trucks, buses, cars, forklifts, trains, etc.

Power-to-gas to store or transport renewable energy

Injection to natural gas pipeline for decarbonization

## **INDUSTRIAL GAS**

Petrochemical (Oil & Gas)

Chemical

Specialty Gas

Power Generation

Pharmaceutical

Semiconductor

Food & Beverage

Research & Development

WHAT WE DO



Our equipment is backed by a veteran team of engineers, factory assemblers and service technicians, providing a local presence to ensure maximum uptime of our customers' operations.

PDC Machines has offices in North America, Europe, China, Japan, and Korea. We also have partner offices in Australia, Middle East, and many locations around the World.

HOW WE SERVE YOU

### Hydrogen Generation



### Gas Compression



### Station Developer



### Hydrogen Mobility



WHO WE SERVE

# LOCATIONS

**PDC Machines - USA:** Offices & manufacturing facilities

Addresses: 1875 & 1707 & 1825 Stout Drive,  
Warminster, Pennsylvania, USA

**Hydrogen Energy:** Americas, Europe, Oceania

E-mail: Jim Petrecky — [j.petrecky@pdcmachines.com](mailto:j.petrecky@pdcmachines.com)  
Telephone: +1 518-763-9777

**Industrial Gases:**

E-mail: Mike Walsh — [m.walsh@pdcmachines.com](mailto:m.walsh@pdcmachines.com)  
Telephone: +1 215-431-0934

**PDC Machines - China:** PDC Machines, LLC. - Asia Pacific

Office Address: Room 1105, Building 2, 1728 Huangxing Rd,  
Yangpu district, Shanghai, China 200433

E-mail: Jason Chow — [j.chow@pdcmachines.com](mailto:j.chow@pdcmachines.com)  
Telephone: +86 21 55381979

**PDC Machines - Korea:** 2017 (Branch Office)

Office Address: A2110-4 Smart Valley, 30,  
Songdomirae-ro  
Yeonsu-gu Incheon, 21990 Korea

E-mail: Mason Lee — [m.lee@pdcmachines.com](mailto:m.lee@pdcmachines.com)  
Telephone: +82-10-2521-1632

**PDC Machines G.K.- Japan:** 2019

Head Office Address: Level 15 Cerulean Tower, 26-1  
Sakuragaoka-cho, Shibuya-ku, Tokyo

Branch Office: KRP NEXT, 3rd floor Blg#4,  
93 Chudoji-Awatacho,  
Shimogyo-ku, Kyoto 600-8815 Japan

E-mail: Takayuki Masuda — [t.masuda@pdcmachines.com](mailto:t.masuda@pdcmachines.com)  
Telephone: +075-315-9840

**PDC Machines GmbH- Europe:** 2020

Head Office Address: Leopoldstrasse 244  
80807 München, Germany

E-mail: Richard Kennett — [R.Kennett@pdcmachines.com](mailto:R.Kennett@pdcmachines.com)  
Telephone: +49 89 208 039 269

[PDCMACHINES.COM](http://PDCMACHINES.COM)



We perform  
under pressure.

ISO 9001:2015 CERTIFIED QUALITY MANAGEMENT SYSTEM