

# SPECIAL PURPOSE VEHICLES

For the Primary Aluminium Smelters  
Efficiency Safety Ergonomics



## Mobile and stationary equipment for the aluminium industry

# WHO WE ARE

HMR Hydeq's business idea is first and foremost to design and build special vehicles for the aluminium industry with high quality that satisfies the strongest demands regarding safety, technological solutions and working conditions in the smelter.

The enterprise, which in 1989 was named Hydeq, grew out of a department of Hydro Aluminium Årdal (one of Norway's largest aluminium smelters), that had been established in 1973. It is today a private company, incorporated in the HMR Group. The holding consists of nine companies, specialised in supply of products, equipment and engineering advice to the aluminium industry for over 60 years.

The products are tailored according to the demands and specifications from the customer. Maintenance, service and spare parts are a natural part of the deliveries from HMR Hydeq. Located very close to Hydro Aluminium Årdal, HMR Hydeq benefits from close co-operation with potroom specialists, operators and R&D personnel in developing the most suitable equipment for pot handling for today's and tomorrow's technologies.

The company is certified in accordance with NS EN ISO 9001:2015 and qualified in Achilles supplier management solution.



# SPECIAL MOBILE AND STATIONARY EQUIPMENT

HMR Hydeq designs and manufactures modern special purpose vehicles and stationary equipment for primary aluminium plants.

TAPPING VEHICLE



POT TENDING VEHICLE



ANODE COVERING VEHICLE



The equipment is carefully adapted to meet the individual needs and requirements of the customers. Maintenance, service and spare parts are the natural extension of services provided by HMR.

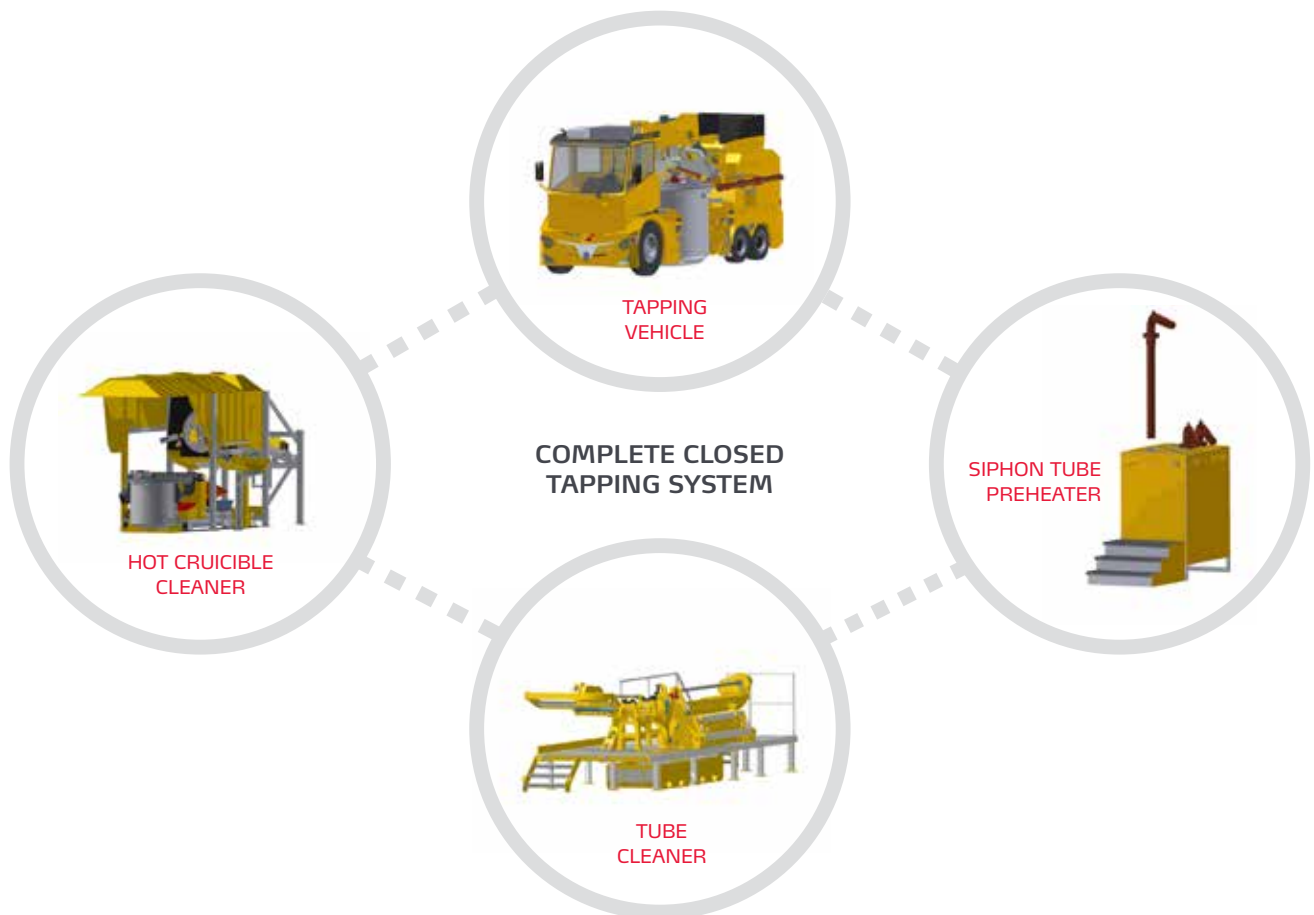
So far the company has produced more than 300 different special purpose vehicles, including:

- Tapping Vehicles
- Anode Changers
- Crust Breakers
- Cavity Cleaners
- Feeders
- Furnace Tending Vehicles, etc.

Our technical solutions create both immediate and long-term benefits for our customers, their employees and the environment.

# TAPPING SYSTEM BASED ON VEHICLES

The most flexible and efficient way of transporting molten metal between the potroom and the cast house in the primary aluminium plant.



Our customers benefit from several major advantages of this tapping system:

- Excellent safety and ergonomics for the operator and the floor personnel.
- High operating speed, flexibility and Just in Time performance.
- Automated and self-sufficient.
- No need for overhead cranes, transporters, additional weighing systems, tilters, etc.
- Reducing operating costs by lower oxidation and lower temperature loss.
- The whole process is controlled by one operator only.





## State-of-the-Art

# TAPPING SYSTEM IN USE

Many aluminium smelters have benefited from HMR's tapping vehicles the last 40 years. In 2009 HMR Hydec supplied the complete tapping system to the aluminium plant in Qatar. Thirteen tapping vehicles, crucible cleaner and other stationary equipment are in operation in Qatalum. The Qatalum contract is the ultimate showroom for HMR's products in the Middle East.

At the beginning of 2012 Rio Tinto Iceland (ISAL) put into operation a complete tapping system, consisting of five tapping vehicles, one crucible cleaner and auxiliary equipment. The system delivered by HMR was chosen after a careful investigation of the most updated products available on the market, taking primarily into consideration safety and efficiency. For ISAL safety is the first priority. HMR's tapping system, which keeps molten metal inside a closed crucible at all times, is a perfect solution.

Most recent deliveries of a complete tapping system took place in 2016, when HMR, in co-operation with Hycast, installed this system, including five tapping vehicles in QIG smelter, Qiaotou, P. R. of China, and in 2017, when HMR Hydec delivered three tapping vehicles and a hot crucible cleaner to Hydro Karmøy's KTP plant in Norway.

# TAPPING VEHICLE

The vehicle is constructed to tap, weigh, transport and discharge the liquid metal in a closed process to obtain the following advantages:

## Operation philosophy

- Maximum safety and operator comfort
- Maximum efficiency
- Maximum precision on tapped and recorded weight
- Minimum temperature loss
- Minimum metal spill and oxidation
- Minimum tapped and delivered dross



## Tapping vehicle's features

- All functions operated from cabin.
- Elevation and traverse system for positioning the crucible for tapping and discharging.
- Vehicle can release and retrieve a fully loaded crucible.
- Regulation of vacuum to minimise bath tapping.
- Automatic stop of tapping when ordered amount is reached, or when crucible is full.
- Registration of tapped amount from each cell, total amount in crucible and dross weight in crucible.
- Completely closed crucible during transport.
- Pressurising the crucible to discharge.
- Discharging through siphon tube makes the metal discharge from the bottom of the crucible and leaves the dross in the crucible.
- Tilt of vehicle to optimise discharge function.
- Very easy and quick replacement of tubes.
- Automatically operated support legs to stabilise the vehicle when the crucible is traversed out.
- Compressor on vehicle for tapping and discharge.
- Weighing system with radio communication (option).
- Tube dimensions from Ø60-Ø100 can be adapted.
- 4-wheel steering, 4-wheel drive, 2 circuit brakes and a list of extra equipment.
- Hydraulic suspension gives excellent driving conditions and reduces the wear on the vehicle.

HMR presently designs tapping vehicles with capacities from 4,000 to 11,000 kgs liquid metal.





#### 5.7-7.0 TON METAL TAPPING CAPACITY

Length	6,360 mm
Height	3,490 mm
Width	2,200 mm
Turning radius	5,400 mm
Total weight, full crucible	27,070 kg
Front axle load	11,710 kg
Rear axle load	2 x 7,680 kg
Max travel speed, adjustable up to 20 km/h	15 km/h
Max. gradient	6°

Other capacities are available – please inquire.

#### BATH TAPPING VEHICLE

Bath tapping vehicle (BTV) is one of the new inventions in the wide range of the special purpose vehicles delivered by HMR. This type of the vehicle is used for delivery of the large amounts of bath collected from several pots to another pot as a part of start-up procedure and for transfer of minor amounts of bath between the pots to keep the bath balance.

HMR's BTV provides the same benefits as a metal tapping vehicle:

- one-man operated
- high operating speed
- high flexibility
- independence from the overhead cranes
- squirt-free operation: bath is delivered through a tube close to the surface of the pot.



#### 7.0-10.0 TON METAL TAPPING CAPACITY

Length	7,700 mm
Height	3,500 mm
Width	2,550 mm
Turning radius	7,315 mm
Total weight, full crucible	36,180 kg
Front axle load	14,100 kg
Rear axle load	2 x 11,040 kg
Max travel speed, adjustable up to 20 km/h	15 km/h
Max. gradient	6°



## TAPPING



Information on the amount of molten aluminium to be delivered and cells to be tapped are directly broadcasted to the driver of the tapping vehicle. No floor personnel is required. By means of the weighing, the system stops automatically when the ordered amount of metal is tapped.

## DISCHARGING



When launder is applied, the MTV can discharge both metal and bath to a pot during start-up procedure.

No need for a tilter in the cast house as the tapping vehicle discharges the metal by itself. The hydraulic suspension system tilts the vehicle during discharging to optimize process.

Dross and bath remain in the crucible due to discharging from the bottom, through a tube. Afterwards HMR's crucible cleaner removes residues in less than 15 minutes, usually one time per shift.



## ERGONOMICS AND MAINTENANCE



The cab has superb driver conditions. Visibility and ergonomic standards have our highest attention. All major components are located to give easy maintenance access.

## CRUCIBLE MOVEMENTS



The vehicle can manoeuvre the fully loaded crucible without help from any additional equipment.

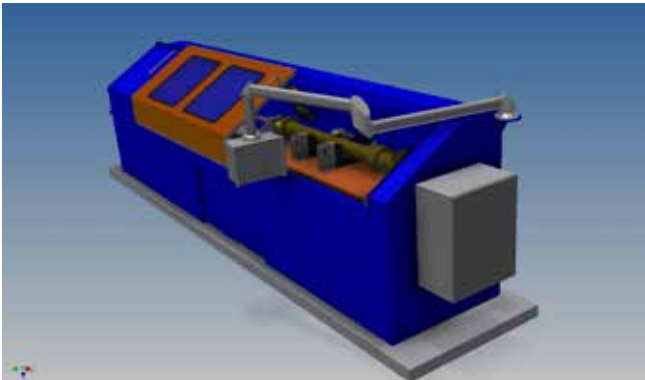
## CRUCIBLE CLEANING STATION



Crucible Cleaning Station is part of HMR's tapping system. The cleaner, like most of the machines from HMR Hydeq, is fully automatic and can be operated by the vehicle operator.

At HMR's crucible cleaning station the crucible can be cleaned while it is still hot. It reduces the total amount of crucibles needed at the smelter and extends the lifetime of the ladles. The tapping vehicle leaves the crucible on a pallet. The crucible is picked up and tilted, in order to empty metal and dross in separate skips. A full profile mill, driven by hydraulic motor, removes dross and other residues in one operation. The optimal temperature for the operation is 600-700°C. A hood ensures that the dust and gases are captured and cleaned in a dust extraction system.

## TUBE CLEANER



Tube Cleaner efficiently removes clogged metal and debris inside tubes used for tapping and discharging of liquid metal. A soundproof hood protects the operator and the environment from noise and dust.

When a tube is inserted, the machine performs the operation automatically.

## IN LINE TUBE CLEANER



HMR presents a new tube cleaner with inventive design which allows cleaning of tapping tubes whilst on the tapping vehicle and cradle. Among many added advantages this design aims at reducing number of the tubes in use at the smelter. By adding optional tube table, this machine can be used for cleaning of straight discharge or tapping tubes, either whole or divided, also when they are disengaged from the tapping vehicle.





**TEAMWORK**



# OVER 60 YEARS AS PARTNER AND SOLUTION

HMR comprises 7 companies with mechanical expertise on integrated systems in the primary aluminium industry. The core business has been developed in Norway and other countries. HMR is now an international concern with many references around the world.

# IS A PREFERRED SOLUTION PROVIDER

ns solutions, products, services and technical advice for the international  
y, following the growth of the importance of the processing industry in this  
he world.

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PROUD WORKERS



# ANODE CHANGING

HMR designs and manufactures two types of anode changers.



## SINGLE ANODE CHANGING

Length	5,100 mm
Height	3,900 mm
Width	2,000 mm
Turning radius	5,300 mm
Total weight	Approx 19,000 kg
Front axle load	Approx 9,000 kg
Rear axle load	Approx 10,000 kg
Max. travel speed	15 km/h
Max. gradient	6°
Max. wheel load while lifting	Approx 11,000 kg
Max. lifting capacity	6,000 kg
Max. lifting cap. hook	4,500 kg

## DUAL ANODE CHANGING

Length	5,770 mm
Height *1	5,680 mm
Width	2,200 mm
Turning radius	5,990 mm
Total weight *1	Approx 20,000 kg
Front axle load *1	Approx 11,000 kg
Rear axle load	Approx 9,000 kg
Max. travel speed	15 km/h
Max. gradient	6°
Max. wheel load while lifting	Approx 11,000 kg
Max. lifting capacity	6,000 kg
Max. lifting cap. each hook	4,500 kg

\*1 Measured during transportation of 2 anodes, each 1,500 kg

The vehicle presents the highest standards for visibility, ergonomics, maintainability and lifetime. Hydraulic suspension gives excellent driver comfort, reduces the wear-out and levels the vehicle. All movements are controlled with multi-purpose joystick and electrical switches. Good access for maintenance and components, chosen especially for rough working conditions, reduces the downtime to an absolute minimum.

This vehicle is designed for dual anode changing with two hooks which are individually adjustable both in horizontal and vertical direction. The crane and the cab are mounted on the same slew ring to ensure perfect visibility in all positions. The driver's position can be rotated inside the cab. As an option this anode changer can be fitted with tools to lift covers on pots and anode pallets. All operations are controlled with two programmable joysticks.



POT TENDING VEHICLE	
Length	6,150 mm
Height	3,200 mm
Width	2,100 mm
Turning radius	5,250 mm
Total weight	15,000 kg
Front axle load	8,000 kg
Rear axle load	7,000 kg
Max. travel speed	15 km/h
Max. gradient	6°
Max. wheel load while lifting	Approx. 7,500 kg
Max. lifting capacity, grab unit	1,300 kg
Capacity of hammer	(13,5 kW) 345 J
Capacity of skip	900 litre

CAVITY CLEANER	
Length	5,970 mm
Height	3,350 mm
Width	1,800 mm
Turning radius	5,000 mm
Total weight	11,200 kg
Front axle load	5,200 kg
Rear axle load	6,000 kg
Max. travel speed	15 km/h
Max. gradient	6°
Skip capacity	900 litre

This Pot Tending Vehicle is a combined Cavity Cleaner, Hammer Breaker and Anode Clamp Manipulator. The vehicle is designed to perform cavity cleaning, crust breaking and releasing/closing anode clamps. The rough working conditions of the aluminium smelters and the comfort of the driver were taken especially into consideration when designing this vehicle. The tools on the vehicle can be adapted to most end-to-end pots.

Cavity Cleaner is equipped with hydraulic suspension, turntable driver's position and electrically controlled fans on the radiator and oil cooler. The turntable driver position gives excellent visibility both in transport and in working direction, and it can follow the grab unit automatically. The vehicle has a sturdy construction, dimensioned for grabs suitable for dual anode changing. The noise generated by the vehicle is very low, 78 dbA, according to ISO/DIN 5128 and ISO 362 (7.5 m from centre of vehicle).



#### CRUST BREAKER WITH KNIFE AND HAMMER

Length	5,550 mm
Height	3,200 mm
Width	2,100 mm
Turning radius	5,000 mm
Total weight	Approx 12,800 kg
Front axle load	Approx 6,400 kg
Rear axle load	Approx 6,400 kg
Max. travel speed	15 km/h
Max. gradient	6°

These vehicles present the highest standards for visibility, ergonomics, maintainability and lifetime.

HMR Hydeq's combined knife and hammer breaker is an effective vehicle with two reliable tools, adapted to the environment of an electrolytic cell. The knife unit is used to release the anodes. Our knife performs a very clean cut and combined with the use of a hammer in the same process, the amount of released crust is reduced to a minimum. The hydraulic hammer is powerful and designed for tough working conditions. Long range, compact design and ability to twist and tilt, makes the hammer flexible and easy to use, all the way to the centre of the pot. The driver enjoys excellent visibility during all operations.



# COMPACT FURNACE TENDING

Furnace Tending Vehicle is used for charging cold metal to the foundry furnaces and to skim and stir the molten aluminium.

COMPACT FURNACE TENDING	
Length, incl. forks	6,140 mm
Height	3,100 mm
Width	2,050 mm
Turning radius	4,300 mm
Total weight when empty	13,500 mm
Front axle load	4,000–12,500 kg
Rear axle load	9,300-2,500 kg

Example:

Lifting 2,000 kg on 2,000 mm stroke gives an axle load of 10,000 kg.



Its telescopic boom, fork spreader and fork tilt are heat resistant for the working temperature inside the furnace. The design ensures that only the metal parts are exposed to the heat radiation.

The driver can perform operations accurately, quickly and effectively and reduce loss of the heat caused by the open furnace door.

# FEEDERS

In order to increase driver comfort, the vehicle is equipped with hydraulic suspension and ergonomically designed cab.

FEEDERS	
Length	6,000 mm
Height	3,400 mm
Width	2,100 mm
Turning radius	6,000 mm
Total weight, fully loaded	18,000 kg
Front axle load	8,000 kg
Rear axle load	10,500 kg
Max. travel speed	15 km/h
Max. gradient	6°
Hopper capacity, single hopper	8 m <sup>3</sup>
Hopper capacity, combined	6+2 m <sup>3</sup>
Feeding capacity, hopper filling	800 kg/min.
Feeding capacity, covering	600 kg/min.
Briquette feeding capacity	400 kg/min.

HMR's feeders are available as Hopper Feeders and Anode Covering Vehicles.

In order to increase driver comfort, the vehicle is equipped with hydraulic suspension and ergonomically designed cab. The driver operates the vehicle from a very well insulated cabin in a protected environment and has excellent visibility and control over the tools, mounted at the front of the vehicle. HMR's Fluoride Feeders are equipped with a volumetric measurement system that is used to control the amount of fluoride during feeding. The feeders deliver masses with no dust leakage and with a minimum of air pollution.



[www.hmr.no](http://www.hmr.no)



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