

Case study



Kårehamn Windfarm ballasted offshore

Ballasting offshore wind turbines with MagnaDense
loose ballast

LKAB Minerals

Wind turbines need heavy ballast



In order to withstand the freezing conditions, motions of the sea and the stresses imposed by the rotating blades, the foundations of the wind turbines need to have a considerable weight without having the associated bulk.

This has been achieved with MagnaDense which ensures that these gravity based foundations withstand and not pollute their natural environment over many decades. We supplied 27,000 tonnes of MagnaDense high density ballasting material to a large-scale wind farm project in Sweden.

Largest windfarm in Sweden

The E.On Vind AB owned project, 'Kårehamn Windfarm' is built in the Baltic Sea on the south east coast of Sweden, at about 5 kilometres outside the small village of Kårehamn. The project was awarded to contractor Jan de Nul in 2011 and became operational during 2013.

At a cost of around €120 million, it is the largest project of its kind in Sweden. It makes use of 16 offshore wind turbines rated at 3MW and has a total capacity of 48 MW. From these enormous turbines a maximum of 180GWh per year of renewable energy is available to Swedish citizens.

Up to 40,000 homes use the electricity generated by wind, which is half of the population of the nearby island Öland. responsible manner.

MagnaDense; more weight, less volume

Design, construction and installation had been awarded to Belgium contractor Jan De Nul who worked together with LKAB Minerals to ensure the foundation's requirements were met through their design and our heavy weight and reliable product.

Due to seabed conditions unsuitable for piles, concrete gravity base foundations ranging from 15m - 25m in height and weighing up to 1,950 tonnes each were chosen to support the turbines.

MagnaDense, a high-grade and heavy dense aggregate, produced from the natural mineral magnetite, was used as a ballast material in the concrete gravity bases. A loose bulk density of 3.0 t/m³ in each of these structures was achieved, enabling the foundations to achieve their design weight whilst minimising their volume.



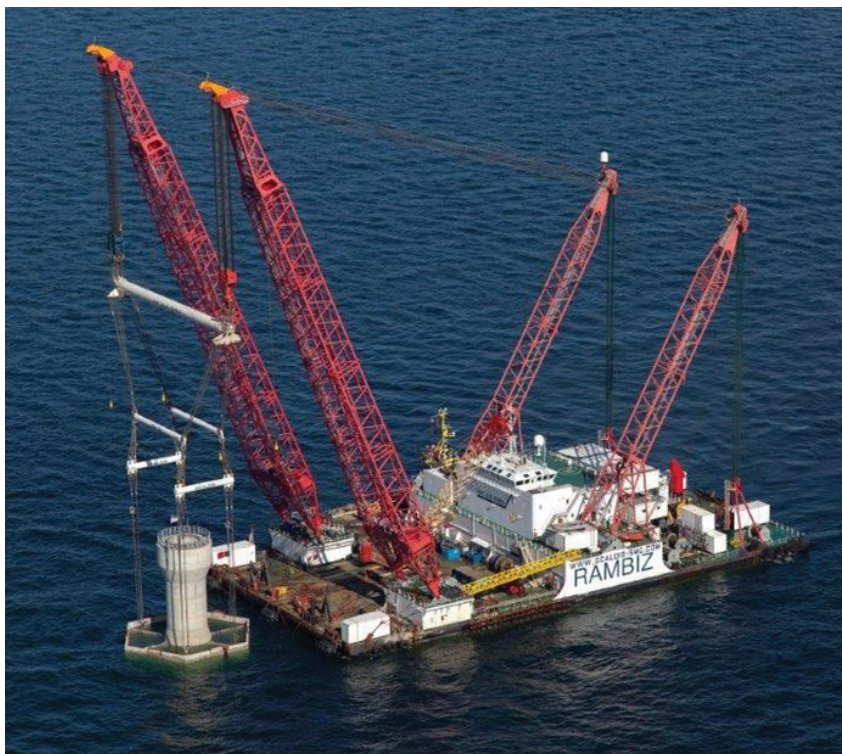
Gravity Based Foundation

Foundation being ballasted with MagnaDense iron ore to withstand the natural forces of the sea and to make preparation for the wind turbine.

Natural product in a natural environment

We market our MagnaDense, a natural iron ore to be used as loose ballast in a large variety of structures world-wide as well as to serve as an aggregate in heavy concrete. With a specific gravity that can exceed 5.0 t/m^3 and being available in different fractions, our product is ideal for creating a heavy ballast without the large volume that many other solutions provide.

It is the perfect material to use in offshore applications either in heavy concrete or as loose ballast where benefits can be seen potentially in reduced logistic costs and less cement and reinforcement. MagnaDense is totally inert and stable in seawater, and being extracted from one of the purest sources available, will not pollute the environment in which it is placed. Additionally, MagnaDense has a CE certification and is approved to EN12620. Being part of the LKAB Group that owns the magnetite mines, we are a reliable supplier that provides products of consistent quality and origin year-round to many projects worldwide.



Gravity based

Transported from harbour to offshore location where these are filled with loose MagnaDense.

PROJECT FACTS: Kårehamn

Project owner: E-ON Vind AB

Contractor: Jan de Nul

Total number of turbines: 16

Project installation: 2012 - 2013

Quantity of MagnaDense: 27,000 tonnes



MagnaDense logistics

High density MagnaDense supplied in barge at the offshore location.



Jan De Nul
GROUP

A very detailed video about the construction of the foundation, its placement and offshore ballasting is available on [YouTube](#).

YouTube



We are leading the transformation of our industry toward a sustainable future.

LKAB Minerals, the international industrial minerals division of LKAB, develops and delivers circular, critical and climate-efficient mineral products. LKAB Minerals has sales representation, offices, production units and deposits in 12 countries in Europe, Asia and the US and employs around 400 people.

LKAB Minerals is part of the Swedish company LKAB, one of the world's leading producers of highly upgraded iron ore products and a major supplier of mineral products for other industrial sectors.

Read more about LKAB Minerals at www.lkabminerals.com



LKAB Minerals