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Hydronamic, independent Port and Waterway Engineers

Hydronamic, independent Port and Waterway Engineers, provides specialist consulting services in the field of ‘wet’ civil engineering. Founded in the late 1960s, the company has gained a thorough knowledge of the behaviour of water—under both natural and forced flow conditions—and of the interactions of water and its surrounding environment. This encompasses the knowledge domains of hydraulics, morphology, hydrology, coastal and river engineering, port construction, environmental engineering and offshore technology.

Studies are performed with the aid of physical and mathematical models, both ‘in house’ as—in close cooperation with the client—on site. Thanks to our association with Royal Boskalis Westminster, world leading dredging and construction contractors, the advisory skills of Hydronamic engineers are complemented by a thorough understanding of the actual execution aspects of construction projects, gained by active on site participation.

Hydronamic’s specific fields of expertise are:
- dredging and reclamation
- soil mechanics
- coastal and shore protection works
- ports and waterways
- marine environment
- offshore earthworks and mining
- morphology and hydrology

Within these fields, Hydronamic provides the following services:
- project studies, advice and design works
- project preparation and construction support
- project development studies
- research studies
- training programs

With a broad variety of studies and consulting tasks, Hydronamic holds a strong position in this area of specialist technology. The organisation and the people are innovative, creative and flexible. As a result, we can provide tailor-made solutions of reputed quality, within strict budget and time constraints. All activities are certified in accordance with ISO 9001.

Questions and Answers

Associated with Royal Boskalis Westminster, Hydronamic is a contractor’s engineering company. But why does a contractor need an in house engineering company? And why should these engineering specialists provide consulting services to third parties? Two questions, one answer:

Because preparation and execution of a construction project requires both theoretical knowledge and a scientific approach, as well as practical experience and real-life construction insight. Clients such as project owners, other consultants and contractors can all benefit from this unique combination of ‘thinking and doing’ offered by Hydronamic. This experience proves especially valuable in the preparation of ‘design and construct’ projects. That’s why!

Clients in many areas of the ‘wet’ civil construction field cope with many other questions. Hydronamic provides them with the answers. You’ll find some of these questions and answers in this brochure. If you have any other questions, let us know!
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Infrastructure projects

Q How to cope with the world’s ever-growing need for more infrastructure, while environmental concerns call for limited development?

A In recent years, Hydronamic has developed technical and commercial concepts for a variety of infrastructural solutions. Many of these proposals have resulted in the actual preparation and execution of projects. Others are being used as underlying studies for developments aimed at relieving traffic congestion.

Slope protection projects

Q When do coastlines, shores or riverbanks require stone protection works?

A The typical Dutch craftsmanship of protecting the low-lying land from high seas and rivers belongs to the strongholds of Hydronamic. Dimensioning is provided for constructions and construction elements, often in combination with a selection of suitable quarries or other sources for materials.

Water management projects

Q While water can be vital to local communities, how does water management contribute to optimally utilise – often scarce – resources?

A Although not every natural flow of water should be tampered by man, better utilisation to the benefit of nature and mankind is often possible. Based on mathematical models, calibrated by field measurements and supported by studies of historical riverbed development, Hydronamic can accurately predict where and how interference will be most effective with least disturbance of the natural environment.

Port projects

Q What defines the operational effectiveness of a port?

A To identify critical points and to provide solutions, Hydronamic employs mathematical models and computer manoeuvring simulations. Where knowledge and know-how end, physical models in laboratories and test flumes are implemented. Even field measurements – like sedimentation monitoring – during early stages of construction can be applied to define final adjustments of the design.

Q How can safe access for vessels be assured?

A How much wave intrusion occurs as a function of the layout and will this affect the navigability to a great extent?

Q What are the requirements for maintenance dredging operations, from current behaviour and sedimentation patterns in the port?

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**Port projects**

A. How to cope with the world’s ever-growing need for more infrastructure, while environmental concerns call for limited development?

Who has insight in technically complex marine projects like immersed tunnels or artificial islands?

What can land reclamation mean for the development of airports, commercial ports, road and railway links and industrial projects?

Who has experience-based knowledge about marine works for fixed links?

What financial structures can help reducing costs of marine transportation projects?

**Slope protection projects**

A. When do coastlines, shores or riverbanks require stone protection works?

How heavy must this protection be and how can it be constructed with minimal disturbance of the present situation?

Will bottoms of canals or potholes be eroded by currents from manoeuvring vessels or by flow around structures?

Can bottom protection with mattresses or stone filters constructions prevent these effects?

**Water management projects**

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How can water quality be improved by restoring lakes?

Could water flows be guided for instance by bypassing inflowing river sediment?

How to cope with the increasing pressure on existing airport?

**Infrastructure projects**

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Can storage reservoirs be inserted without damaging downstream development?

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**Water management projects**

A. While water can be vital to local communities, how does water management contribute to optimally utilise – often scarce – resources?

Could water flows be guided into more useful directions?

Can training works be performed to divert rivers or should structures of sluices and dams be used to control level changes?

Can storage reservoirs be inserted without damaging downstream development?

Is it possible to extend the lifetime of reservoirs, for instance by bypassing inflowing river sediment?

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Coastline projects

Q How will coastlines develop over time, with granular materials migrating by current and waves? Will nourishment schemes be economically justifiable and how can sediment be prevented from returning to deeper waters? Should foreshore suppletion be preferred over traditional schemes?

Offshore projects

Q What are the options for platform seabed preparation? How can offshore pipelines for the energy industry be stabilised and protected by berms of granular material? Can these materials also be used for thermal insulation?

Q How accurate and in which ambient conditions can these constructions be made? Is it feasible to dredge or plough trenches for pipeline burial or for.lastname and outfalls?

Q How will coastlines develop over time, with granular materials migrating by current and waves? How can these trenches be efficiently and effectively backfilled? How much sediment plume transport will dredging generate?

Environmental projects

Q To what extent does a marine construction process impact the environment? How much sediment plume transport will dredging generate? Where will dredged spoil migrate, that originates from offshore processes or outlet boxes?

Q How attractive are artificial stone reefs to fish, lobsters and sea bass? How attractive are artificial stone reefs to fish, lobsters and sea bass? And to fishermen? Can dredged materials be beneficially used, either “as is” or after treatment?

Q What are the options for platform seabed preparation? Can these trenches be efficiently and effectively backfilled? Where and how can a disposal site be constructed, managed and monitored?

Hydronamic has studied all these questions for several projects in various parts of the world. Advice given, based on studies and large-scale trials, has in many cases led to (more) profitable mining.
Coastline projects

- **Question:** How will coastlines develop over time, with granular materials migrating by current and waves?
- **Answer:** Will nourishment schemes be economically justifiable and how can sediment be prevented from returning to deeper waters?

- **Question:** How will construction works affect the balance in littoral transport and how can deficiencies effectively be compensated?
- **Answer:** Should foreshore nourishment be preferred over traditional schemes?

- **Question:** Based on experience from field measurements and model studies, Hydronamic has developed a range of tools for the prediction of coastal behaviour and the design of coastal protection schemes.

Mining projects

- **Question:** Depending on the conditions, can ‘wet mining’ be more efficient than ‘dry mining’?
- **Answer:** How can large volumes of overburden best be removed by dredging techniques?

- **Question:** Is it feasible to transport and handle tailings by hydraulic pipeline processes?
- **Answer:** Should deep-sea mineral reserves be considered mineable?

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- **Answer:** Can these trenches be efficiently and effectively backfilled?

- **Question:** What are the options for platform seabed preparation?
- **Answer:** How can long-term assurance of a safe burial depth be achieved?

- **Question:** For these and other complex aspects of pipeline and platform intervention, Hydronamic is able to provide innovative viewpoints. Based on a thorough understanding of dredging and trenching processes, and of sea-bottom behaviour, Hydronamic has prepared cost-effective schemes, several of which have found their way to industry-wide implementation.

Offshore projects

- **Question:** Are there other options for platform seabed preparation?
- **Answer:** Can these trenches be efficiently and effectively backfilled?

- **Question:** How can long-term assurance of a safe burial depth be achieved?
- **Answer:** Forcados, Nigeria: Design and site engineering for coastal protection works, including beach nourishment, slope revetment and groyne construction along existing coastal road.

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