TidalSense
Condition Monitoring for Tidal Stream Generator.

SEVENTH FRAMEWORK PROGRAMME

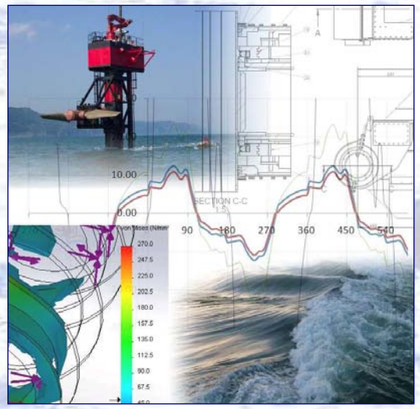
DEVELOPMENT OF A CONDITION MONITORING SYSTEM FOR TIDAL STREAM GENERATOR STRUCTURES

TidalSense is a two year project sponsored by the European Commission under the Seventh Framework (FP7), research for the benefit of the SMEs. The project aims to deliver a condition monitoring system for tidal stream energy conversion equipment. Within the project two concepts will be investigated using ultrasonic guided waves.

Tidal currents are being recognized as a resource to be exploited for the sustainable generation of electrical power. The high load factors resulting from the fact that water is 800 times denser than air and the predictable and reliable nature of tides compared with the wind makes tidal energy particularly attractive for electric power generation. Practical tidal energy generation installations could supply 9% of the world's present electricity requirements. Growth in the tidal energy sector will help to reduce carbon emissions.

One of the key challenges facing the growth of the tidal energy sector is the expense and complexity associated with machine operation and maintenance. Remote condition monitoring would reduce or eliminate the need for inspection personnel to travel out to offshore installations. These installations are inherently located in regions of fast-moving tidal flow and may be completely submerged, making personnel access hazardous.

By considering monitoring logistics in the design stages of different technologies, the TidalSense system can be carefully integrated into equipment and provide mutually beneficial input to data transfer and machine performance control.



As the longest standing engineering consultants in the marine energy conversion sector, IT Power is well placed to inform the development of the TidalSense system.

Using past and present understanding of tidal technology, IT Power is helping to ensure that the TidalSense project is geared towards producing a practical and effective product.

IT Power are providing information on defect types and sizes, environmental condition information and sector requirements based on the technology under development.

The TidalSails/RiverSails system combines the efficiency of large, low cost energy collector area consisting of multiple wings like sails, with alpine skilift technology.

Each individual sail will automatically seek optimal angle into the current, allowing its significant pulling force, via the ropes to turn the large sheaves, which in turn drives the generators.

An efficient peak shaving principle will be implemented. One 300x300 metre triangle could yield as much as 15MW in 4m/s - €0,03KWh

Furthermore, its ability to span deep streams, fully submerged beneath shipping lanes, with simple installation and anchoring system.

Condition monitoring system

A pulser-receiver system called Teletest® will be employed to inspect the cables on the Tidal Sails system. It will also be used for the generation of guided waves to inspect the composite blades in the tidal stream generator structures.

Teletest® is a long-range ultrasonic non-destructive testing technology developed to generate guided waves for detecting metal loss in pipe work when access is difficult. It is a pulse echo system aimed at testing large volumes of material from a single test point.

Teletest® is primarily a screening tool with the added feature of focusing the sound energy into a specific region to measure the distribution of the defects for further evaluation using other NDE methods.

Guided waves

The inspection of engineering structures using long-range guided waves is attractive because it is possible to investigate complete material volumes in regions over 100m away from the point of measurement. Guided wave ultrasonic inspection is different from conventional ultrasonic inspection, since an array of transducers fitted round the outside of the part being inspected sends a sound wave along the length of the component, rather than through it. The component itself constrains the waves along the pipe wall. The received signal depends on the nature of the reflecting surface. Therefore, discontinuities such as corrosion or metal loss can be detected analysing the reflected wave.

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Project consortium:

TWI Ltd, I&T Nardoni, Tidal Sails AS, iKnowHow Informatics S.A, Kaunas University of Technology, IT Power Ltd, Center for Research and Technology Thessaly, EnerOcean SL, InnotecUk Ltd.

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