

內聯閉式輸水管水力發電系統

A Novel Inline Hydropower System for Power Generation from Water Pipelines

一種應用於輸水管道的結合眼型入口集流器和多頁中空球型垂直軸葉輪的內聯閉式水力發電系統
An inline system with an eye-shape inlet nozzle and a multi-blades hollow spherical vertical axis impeller

專利申請編號及國家：HK1150355 (香港)

特色與優點

- 獨特的眼型入口集流器
- 獨特的多頁中空垂直軸葉輪
- 將水管內多餘水頭轉換成電能給檢測系統供電
- 安裝簡單和占用安裝空間小

應用

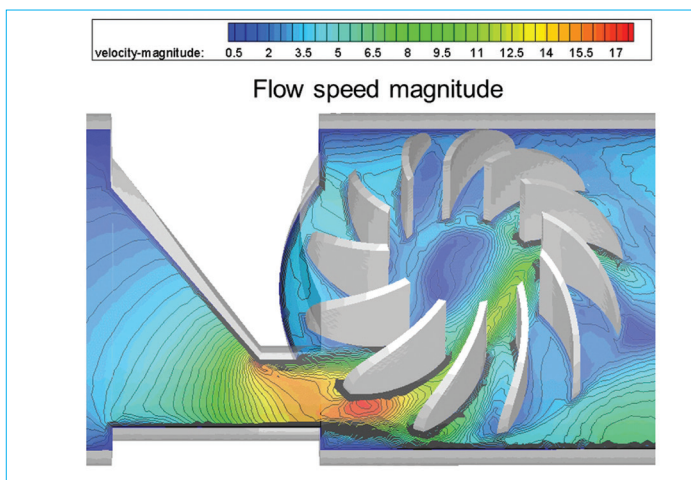
- 為城市和偏遠地區的地下水管監測系統提供穩定的電源
- 由於該系統安裝簡單和占用空間小的特點，所以其特別適用於城市的地下水管監測系統
- 可以應用與低水頭發電場所

獎項

第40屆瑞士日內瓦國際發明展 — 銀獎 (2012年4月)

為了保證城市食水和鹹水供應的可靠性，地下水管監測系統的穩定運行非常重要，由於有限的地下空間和輸運的限制，所以為地下監測系統提供穩定的電源不是一件簡單的事情。然而，一種新型的內聯閉式水管發電系統的開發解決了電源供應的難題。該系統結合了獨特的眼型入口集流器和多頁中空球型垂直軸葉輪，不但將一定量的水管內多餘的水頭轉化為電能，而且還易於安裝在城市供水管線上狹小的空間，當然也適合於一些遠離電網的地區。

多個月來，香港特區政府水務署已經應用了本系統，為供水網絡的監控管理和遙距傳訊系統供電。這項目亦將會是該署未來在地下設施管理和水質監控領域上的長遠發展策略之一。



新渦輪設計的流體力學特性
Fluid dynamics simulation of the new water turbine design



安裝在水管內的噴嘴和葉輪，
入水口（上圖）和出水口（下圖）
The nozzle and impeller installed inside the pipe,
viewed from the water entry (top) and water
exit (bottom) side respectively



採用微型發電機，適合在狹窄的地下水管空間安裝
The hydro generator system is compact for installation in the narrow
underground space of water mains pit

To ensure reliability of a city's drinking water and saline water supply, the performance monitoring of its underground water pipe network is very important, but it is always not easy to provide electric power supply to the monitoring devices due to limited underground space and transportation restriction. A novel inline mini hydroelectric system, which includes an eye-shape inlet nozzle and the multi-blades vertical-axis spherical hollow impeller, was developed which can not only convert the superfluous water head into electrical power, but can also be installed in limited space, especially at remote areas without utility grid.

Water Supplies Department of the Hong Kong SAR Government has already installed several systems in underground water mains for over 4 months. The power generated could support the sustained and continuous operation of real-time pipe monitoring and telemetry equipment. They are among the strategic components in the long-term development of underground asset management and water supply quality assurance of the Department.

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Special Features and Advantages

- Eye-shape inlet nozzle
- Multi-blades vertical-axis spherical hollow impeller
- Consuming superfluous water head in water pipes
- Applicable in limited space and remote areas to generate electric power for monitoring applications without grid

Applications

- Offering electric power for monitoring devices of underground water pipe network in urban and remote areas
- Especially suitable for the underground water pipe network in urban city which has limited space and is difficult to connect to grid for data system monitoring devices
- Applicable in low water head sites

Award

Silver Medal - 40th International Exhibition of Inventions of Geneva, Switzerland (April 2012)



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