

## Case story

# Putrajaya Sewage Treatment Plant, Malaysia

**Strict harmonics requirements, limited space and a limited budget – VLT® frequency drives made it possible.**

When the Putrajaya Sewage Treatment Plant STP 2 was built, there were some important requirements regarding the frequency converters for control of pumps and blowers:

- THvD of less than 5%
- minimal cost for harmonic filters because of the limited budget

- limited size of the drives and filters because of the limited space available.

Although another supplier was initially preferred, in the end Danfoss was awarded the Putrajaya project. The advantages offered by Danfoss were the small size of the VLT® frequency converters and harmonic filters, the advantages of the VLT® Advanced Active Filter AAF 005 and the high energy efficiency and smart cooling concept of the drives.

The **Putrajaya** plant is the largest and most advanced wastewater treatment facility in Malaysia.

Putrajaya, also called the 'Garden City', is intended to become an ultra-modern city equipped with the latest state of the art facilities. Putrajaya is located approximately 25 km south of Kuala Lumpur.

Less than  
**5%**

Total Harmonic  
Voltage Distortion  
and very little space.





005 filters were still compensating harmonics generated by other frequency converters in the plant.

### Space

Panel width was limited to only 3.7 metres, meaning the dimensions of the frequency converters and harmonic filters were an important issue for Putrajaya STP 2. As the VLT® AQUA Drive is among the smallest drives available in its power range, it could be successfully installed in the limited space.

So besides a total lower investment than using the next best alternative, the choice of VLT® AQUA Drive also resulted in energy savings. Based on lower heat loss and the smart back channel cooling concept, VLT® AQUA Drive offers higher energy efficiency than the next best alternative in the market, resulting in significant energy savings, year after year.



higher harmonic distortion, costing more and occupying average space

After investigating and comparing these options, Putrajaya STP 2 selected a combination of standard VLT® frequency converters in combination with both active and passive harmonic filters.

With the AAF 005 active filter solution, the customer was able to eliminate all capacitor banks that were initially required for power factor correction, helping to cut costs. An additional advantage was that when the 450 kW frequency converters controlling the blowers were not in use, the AAF

### Harmonics

The major requirement for Putrajaya STP 2 was to keep the Total Harmonic Voltage Distortion (THvD) below 5%. To keep harmonics as low as possible, three solutions were investigated:

- standard VLT® frequency converters in combination with the Danfoss Advanced Harmonic Filter AHF 010 passive filters – giving the best possible harmonic mitigation but occupying a relatively large space
- standard VLT® frequency converters in combination with both AHF 010 passive filters and AAF 005 harmonic filters – taking up much less space but resulting in a slightly higher harmonic distortion and greater cost
- VLT® Low Harmonic frequency converters in combination with passive filters – again with slightly

Meeting all system requirements – the high energy efficiency, the small unit size, and the total CAPEX reduction – made it easy for the Putrajaya management to choose the Danfoss solution.

The 450 kW drives were available in an IP 54 stand-alone version and it was possible to install all drives and filters in the limited space:

- 3 pcs VLT® AQUA Drive 450 kW
- 2 pcs VLT® Advanced Active Filter AAF 005, 190A
- 6 pcs VLT® AQUA Drive 110 kW installed complete with 6 pcs Advanced Harmonic Filter AHF
- 2 pcs VLT® AQUA Drive 250 kW installed complete with 2 pcs Advanced Harmonic Filter AHF
- 6 pcs VLT® AQUA Drive 30 kW
- 12 pcs VLT® 2800 18.5 kW
- 16 pcs smaller VLT® 2800 frequency converters
- 1 pc VLT® Soft Starter MCD 500 220 kW