

# GRUNDFOS HELPS YOU UNDERSTAND EFFICIENCIES FOR WASTEWATER PUMPS



**Increasing concerns about CO<sub>2</sub> emissions and energy costs has led to greater focus on energy use worldwide. Grundfos is uniquely positioned to ensure a correct understanding of efficiencies and how these combine with hydraulic free passage and constructional robustness in state-of-the-art wastewater pumps.**

Environmental issues have led to legislation that places new requirements on wastewater handling. Pumping wastewater through the collection network or around the treatment plant accounts already today for a substantial part of the energy bills faced by municipalities and water utilities.

By choosing state-of-the-art wastewater pumps with the highest total efficiency, no compromise on hydraulic free passage and constructional robustness, you are well on the way to bringing down CO<sub>2</sub> emissions and reducing operating costs for wastewater pump systems.

Below you will find how Grundfos talks efficiencies on wastewater pumps. Unfortunately there is as yet no minimum efficiency standard for wastewater pumps, unless they are driven by fan-cooling electrical norm-motors. At Grundfos, we have vast experience working with efficiency standards, and we also set our own standards to ensure optimum motor efficiency for our customers. We have prepared the following guide about wastewater pump efficiency, which will help you make the correct pump selection and avoid the most common pitfalls.

## **Total efficiency**

What matters to your energy bill is the total efficiency – meaning the total wire-to-water efficiency defined in the ISO 9906:2012 - and ANSI/HI 11.6 standards to which all wastewater pumps are tested. In a wastewater pump there will be electrical, mechanical, and

hydraulic losses. A pump manufacturer needs to master all of these without compromising reliability. Grundfos does precisely this and can therefore supply high efficiency products.

## **• Electrical efficiency**

The IEC 60034-30 - Part 30 (Ed.1.0) standard defines the minimum efficiency classes (IE codes) for electrical motors, single-speed, three-phase, cage-induction fan-cooled motors. When Grundfos states that a wastewater pump is made from IE3 motor components, it means that the motor components (i.e. stator and rotor) if build into a fan-cooled electrical norm motor, will meet and pass the IE3 efficiency class mentioned in the IEC 60034-30 standard.

Why not mark the wastewater pump with a IE3 label?

This cannot be done based on two points: First of all the IEC 60034-30 standard does not apply to other motors than single-speed, three-phase cage-induction motors i.e. not motors integrated in wastewater pumps. Secondly the constructional differences between a norm motor and a wastewater pump with integrated motor adds additional mechanical efficiency losses to the wastewater pump motor (e.g. angular contact bearings, shaft seal, etc.).

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• **Mechanical efficiency**

Pump efficiency is only interesting if reliability is not compromised. Pump maintenance is costly, whether planned or unplanned, and Grundfos does not compromise on reliability with our products. For constructional robustness with key components, Grundfos for example uses:

Angular contact bearings: Even though angular contact bearings have higher friction losses compared to ordinary roller bearings, we have decided to keep these types of bearings to gain longer lifetime in heavy-duty operation.

Shaft seal: Grundfos pumps come with double mechanical shaft seals in a cartridge solution. This robust construction consumes additional energy, but ensures longer operational time and less downtime. Replacement is easily done in the field without use of special tools.

• **Hydraulic efficiency**

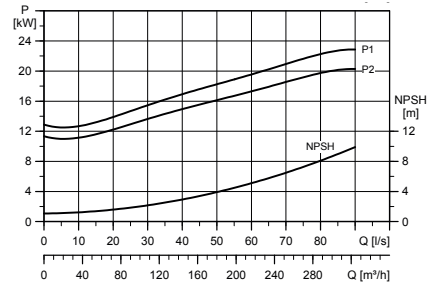
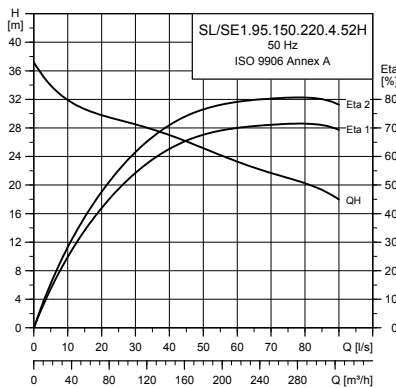
Traditionally there has been a trade-off between free passage in hydraulics for reduced clogging, and high efficiency. Grundfos has resolved this traditional compromise and is able to supply wastewater pump systems that offers superior hydraulic efficiency over a wide operating range without compromising free passage.

• **Reading Curve charts and technical information**

When reading curve charts and technical information the following needs to be observed. First of all one need to be sure that the information given is according to the international performance acceptance test standards ISO 9906:2012 or ANSI/HI 11.6. Otherwise it will not be possible to compare the different pump manufacturers' products against each other. Secondly always make sure to use the total efficiency as reference. Only by learning about the total efficiency you can be sure that all friction losses are included. An example of this can be seen below. In the curve chart the pump performance curves are shown. The upper efficiency curve (Eta2) is the pump efficiency curve (eta pump). The lower efficiency curve (Eta1) is the total efficiency curve (eta pump + motor),

taking all electrical, mechanical, and hydraulic losses into consideration.

The difference between the two efficiency curves is the sum of all other losses (electrical and mechanical), and includes hereby also friction losses from e.g. angular contact bearings and shaft seal that is needed to make a robust wastewater pump. Many companies publish "motor efficiency" as well, often as one figure valid for the best efficiency point (BEP). When using the motor efficiency, always pay attention to what is included, as some include only the electrical losses, and hereby ignore the mechanical losses. So - once again - always compare total efficiency during pump selection, as it is the only efficiency figure defined by international standards, and what matters to your energy bill.



**Grundfos sets efficiency standards**



At Grundfos, we have vast experience working with efficiency standards. Grundfos was instrumental in the drafting and passing of the so-called EuP Directive, setting the ecodesign requirements for electric motors for energy-using products (EuPs) in the European Union. As a technological leader of high-efficiency motors, Grundfos was invited to help with the technical aspects of the legislation.

We also set our own standards to ensure optimum motor efficiency for our customers. We ensure that our motor technology answers the real needs of the application in which the pump system or solution is installed – with an emphasis on reliability and efficiency. We call this Grundfos Blueflux®, and the label guarantees the highest motor efficiency from Grundfos. A pump system or solution with a Grundfos

Blueflux® motor has a considerably higher total efficiency than comparable solutions and reduces lifecycle costs substantially.

In mid 2014, Grundfos will be releasing a new and expanded range of wastewater products that will help you increase your total wire-to-water efficiency, which is central to keeping your CO<sub>2</sub> emissions and costs down. Let Grundfos help you find the right pump for your specific application and optimise your business.