



### Highlights

- Easy to retrofit
- Promotes nitrification
- Compact process
- Improves sludge characteristics
- More robust process
- Less sensitive for temperature variations
- Future expansion possible

### Used for treatment of wastewaters from:

- Municipalities
- Food&Beverage industry
- Pulp & paper industry
- Oil, gas and petrochemical industry

### Hybas™ combination process

In the AnoxKaldnes Hybas™ combination process, the best from two well-known technologies; activated sludge and MBBR, are combined. This process provides extra advantages that can be described by the unbelievable formula,  $1 + 1 = 3!$

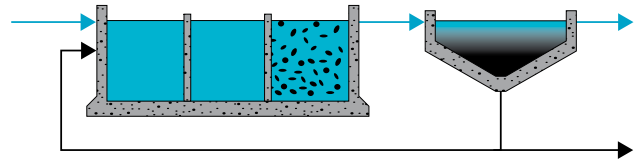
The Hybas™ combination process is a compact solution requiring little process volume to achieve both reduction of organic material and nitrogen. This process solution is often a cost effective way of upgrading an existing activated sludge system to also comprise nitrogen removal or improve the capacity of the nitrogen removal process. By adding carriers to the whole or a part of the aerated activated sludge volume, the nitrification capacity can be increased within the existing volume because high amounts of nitrifying bacteria are enriched on the carriers. BOD removal and denitrification will typically occur in the suspended phase. Thanks to the biofilm solution, the long suspended sludge age normally needed in the AS to achieve nitrification can be reduced. A reduction of the sludge concentration in the AS will also lead to less sludge load on the secondary clarifiers. Another benefit is that a short sludge age will often reduce the risk of growth of filamentous bacteria and generally, the biological activity is higher in an AS process with low sludge age than in one with a high sludge age. One can therefore achieve high denitrification activity in a Hybas™ combination process.

Factors that affect the overall design of an upgrade include media type, aeration system, dissolved oxygen concentration, effluent NH<sub>3</sub>-N concentration, basin configuration and hydraulic profiles through the basin. All these elements are necessary design factors, which have to be considered to create a well working Hybas™ system. Should one of these factors not be considered or designed properly, the overall treatment system could be adversely affected.

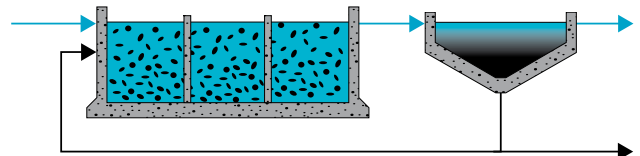
## Process configurations

The Hybas™ combination process can be used both in plants designed for only nitrification or for nitrogen removal with denitrification normally taking place in a denitrification reactor without carriers. It can also be used together with an anaerobic selector for biological phosphorus removal.

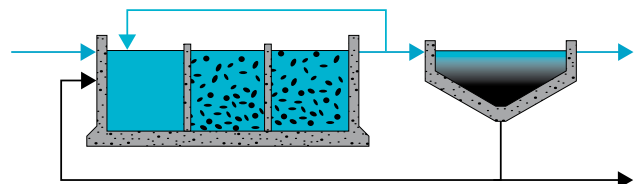
Examples of these different process configurations are shown to the right.



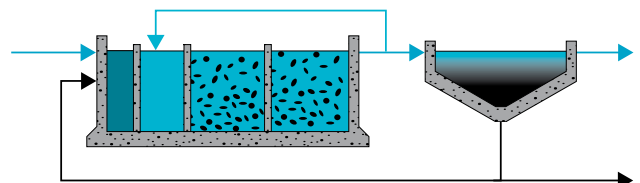
*Hybas™ combination process with nitrification.  
Partial hybrid volume.*



*Hybas™ combination process with nitrification.  
Complete hybrid volume.*



*Hybas™ combination process with nitrification  
and pre-denitrification for nitrogen removal.*



*Hybas™ combination process with nitrification  
and pre-denitrification for nitrogen removal  
and selector for phosphorous removal.*

