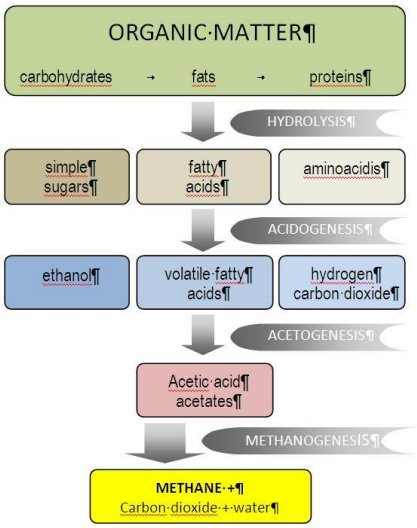
Anaerobic digestion is a natural biological process performed in absence of oxygen by specific bacterial colonies, by means of which organic matter is converted in biogas (picture 1), mainly composed of methane and carbon dioxide.

Such a process can be utilized for treatment of some industrial liquid wastes, because of its capability to reduce, with appropriate conditions, up to 95% of organic load (COD), with minimal power consumption; organic load, rather than feeding biomass growth as it happens in aerobic treatments, it is almost totally turned into biogas, combined with very low biomass production.

Optimal conditions for this process to be applied occurs in presence of wastes with high concentration of carbohydrates (high COD rate) and not too low temperature, because anaerobic process is operated by mesophile bacteria, whose optimal environment is between 20 and 40 degrees: lower temperatures would require heating, even if it could be supplied with a part of produced biogas.

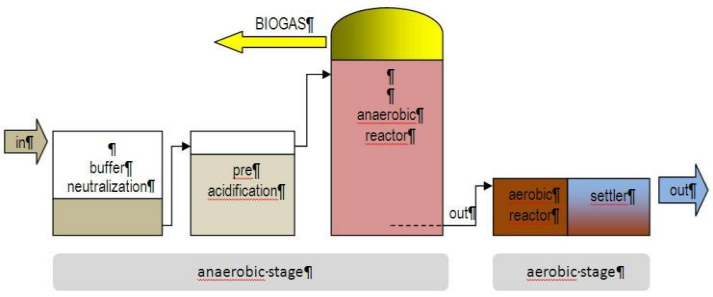


Picture 1

SOME INDUSTRIAL APPLICATION AREAS:

- Food and beverage (breweries, sweet drinks productions, distilleries, confectionaries, dairy farms)
- Pharmaceutical
- Biodiesel production
- Petrolchemical
- Papermills

There where organic load is very high anaerobic processes are much more favorable if compared with aerobic processes, because the latter ones would require huge basins and higher operational costs. In case purification obtained with the only anaerobic stage was not enough strong to comply with discharge requirements, waters coming out the anaerobic stage could be further treated in a following aerobic stage (picture 2), which would be much smaller because of pre depuration obtained in prior anaerobic stage.



Picture 2 – Anaerobic stage + finishing aerobic plant flow scheme

BENEFITS OF ANAEROBIC TREATMENT:

- Up to 95% organic load reduction with minimal power supply
- Lower biomass growth, less amount of sludge to be disposed
- Biogas production
- Possibility to realize the finishing aerobic plant up to 10 times smaller
- Low operational costs

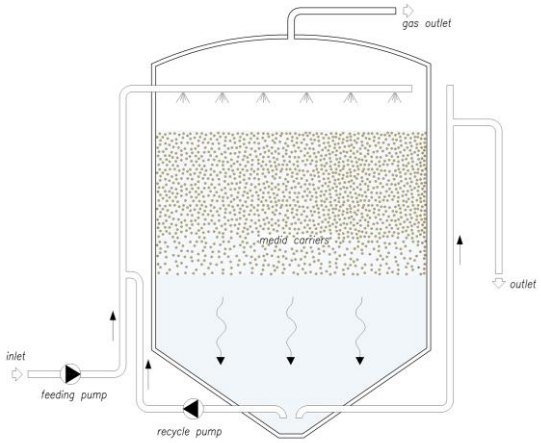
THE TECHNOLOGY

Anaerobic digestion, especially in case of industrial waste water – where hi-load reactors must be foreseen because of the high organic and hydraulic incoming load (conventional low-load reactors would require huge basins) – is a delicate process which, to well work, must fulfill several functional and biological balances. That is the reason why, when we've chosen which "path" to follow, we've rejected the most complex ones (UASB, Fluidized Bed, …) focusing on more simple and stable solutions, such as **downflow moving bed anaerobic digestion** (Picture 3).

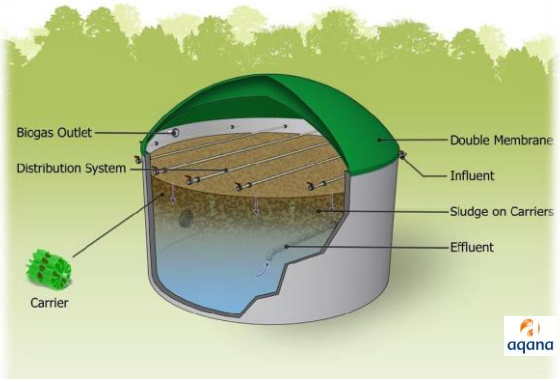
It is a HI-LOAD process (12-25 KG_{COD}/mc*day), which allows to reduce required volume and, therefore, also reactor's dimensions, characterized by following peculiarities:

- Reactor is fed from the top
- Biomass lives and grows attached to plastic supports (media carriers) floating into the top side of the tank
- Treated water is discharged through the bottom

Downward flow and the biomass "anchored" to media carriers features minimize the effects o an eventual biomass worsening (sudden overload, acidification, plant fault…) which, in case of shock, tends to emerge and, in case of conventional reactors, to come out together with the discharge flow.



Picture 3 – Downflow moving bed reactor flow



Picture 4 – Downflow biocarrier reactor's rendering

ADVANTAGES OVER CONVENTIONAL ANAEROBIC REACTORS:

- Lower sensitivity to load peaks and to biomass "shock" effects
- No formation of foam scabs on the surface, because of top - feeding
- High steadiness and reliability
- Simple construction, simple technological scheme
- Easy to operate
- Feasible also in squared tanks, suitable to be realized inside already existing tanks

We have chosen this technological scheme because it appeared to us the one less affectable to problems that usually occur to conventional anaerobic systems. Rising and loss of biomass due to "shocks" are the most difficult events, even because natural biomass re-growth, unless an inoculation is carried out, requires several months. The above mentioned problems and operational complications have contributed, over the years, to obstruct the diffusion of anaerobic digestion.

CID, by virtue of reliability of the described technical solution, believes in this model for evident advantages in terms of building and operating cheapness.

Picture 5 – Finishing MBR aerobic stage after anaerobic digestion (2 digestors are visible on the background)

CID s.r.l. - Via Pradis, 19 - Colloredo di Monte Albano - ITALY Tel: +39 0432 888070 - Fax +39 0432 888069 - Mail: cid@cidgroup.it
V.A.T. and Fiscal codes: 00608530309
www.cidgroup.it