

Liquid Thin Film Technology

**New innovative way of enabling gas transfer in/out of liquid
with extremely high power efficiency**

US Patent No. US 8,292,271 B2 and US 7,494,534 B2

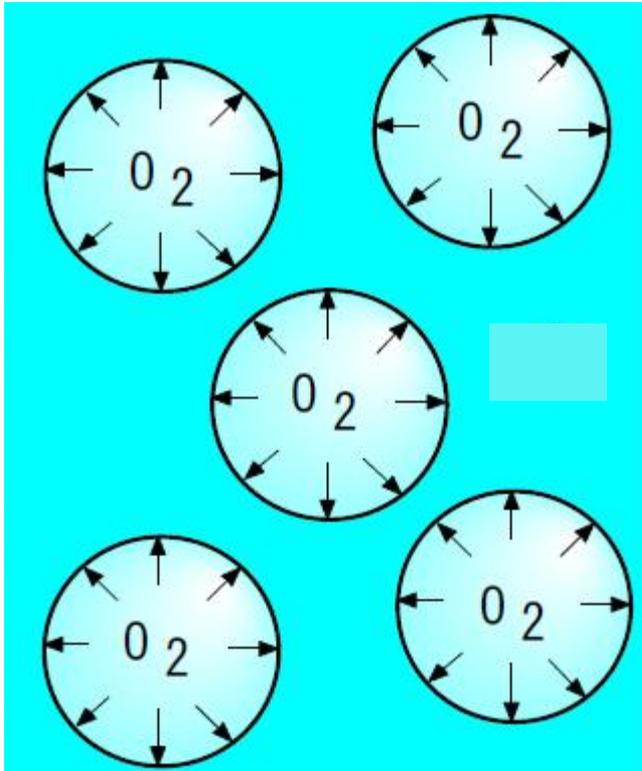
Liquid Thin Film (LTF) Concept

LTF technology is a new concept of gas transfer in and out of liquid. Instead of making small bubbles, it makes water all bubbles.

- All liquid to be processed will become numerous number of soap like bubbles, surrounding gas as thin liquid film, which enables the gas transfer extremely efficient.
- Very low power operation. Small footprint with scale up capability.

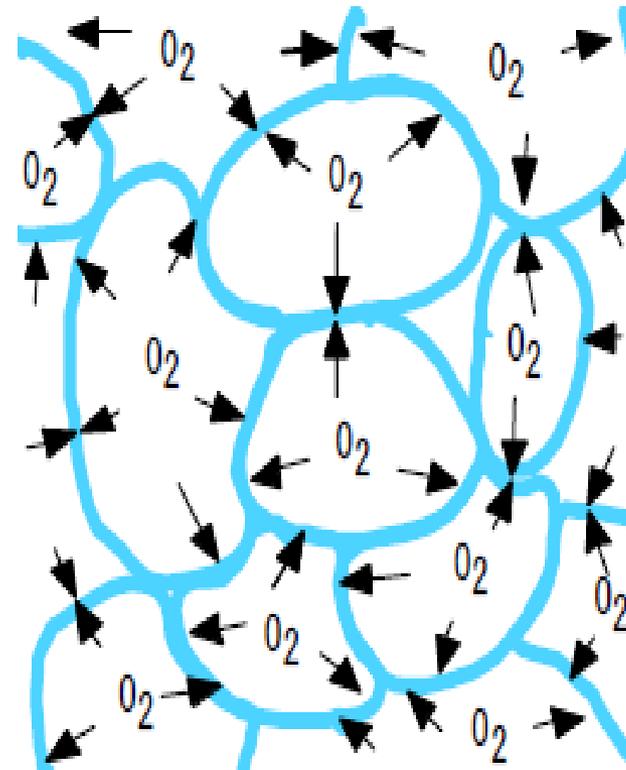


LTF Gas transfer (case of oxygen)



Conventional aeration

Making bubbles small to increase liquid/gas boundary area

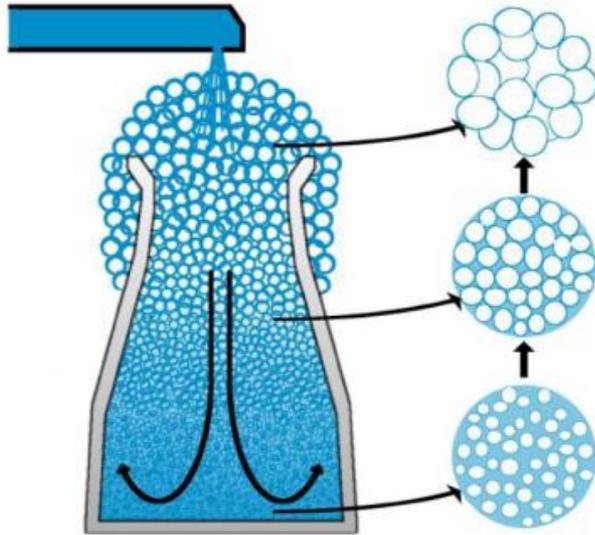


LTF

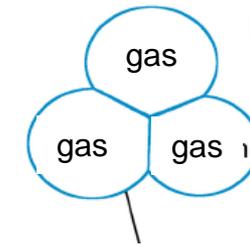
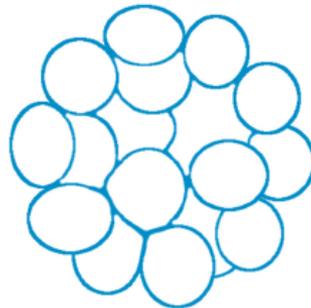
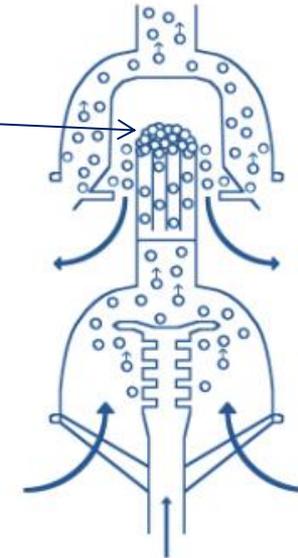
Making liquid in thin film form around gas to increase the boundary area

LTF production and gas transfer

LTF production using pressurized liquid

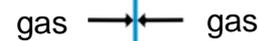


LTF production using pressurized gas



Liquid as thin film

Instant gas transfer



Saturated dissolved gas in liquid

Existing fine bubble aeration method in wastewater treatment

- Using diffuses (commonly fine bubble diffusers), injecting air into wastewater to make air dissolved.
- The dissolved oxygen will be consumed by aerobic bacteria but dissolved nitrogen gas or carbon dioxide will remain in the water.
- Continuous air injection will cause the water to be super saturated with nitrogen gas and carbon dioxide so that new air become very hard to be dissolved.

Dissolved gas in the mixed liquor (ML) in an aeration tank

Results of measurement of dissolved gas concentration in ML

Dissolved concentration of gases (mg/L)			
	Measured in ML (a)	Value of saturation (b)	a/b
N ₂	48.6	17.8	2.7
CO ₂	79.5	0.58	132
O ₂	0.71	9.56	0.07
Measured by head-space-method, using Gas Chromatography			

LTF

“gas exchange” not gas injection

- For such condition of water on previous page, you need to remove excess dissolved gasses (nitrogen gas and carbon dioxide) then replace with new air.
- LTF balances gas ratio of new air and dissolved gases by equilibrium and keep the dissolved gas in the water at saturation level (would not create super saturation condition caused by small bubble injection).

<https://www.youtube.com/watch?v=VQMxoBPmb2I&feature=youtu.be>

LTF applications and benefits

LTF work for various applications including wastewater, drinking water, dam/pond/storm water, aquaculture, hydroponics, bio-reactors, algae growth, gas dissolution/stripping etc.

- Extremely low power consumption
- Operate by gas inlet with low pressure loss
- High gas transfer efficiency
- Large aperture - No clogging, low maintenance
- New construction or retrofit
- Various device configurations – Design flexibility
- Move water and aerate at the same time – FB-50h
- Scale-up capability
- Small foot print

Looking for Business Partners

- **Components OEM supply**
- **Technology collaboration**
- **Technology licensing**

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Appendix

Various LTF products



AWA200 2 layer unit



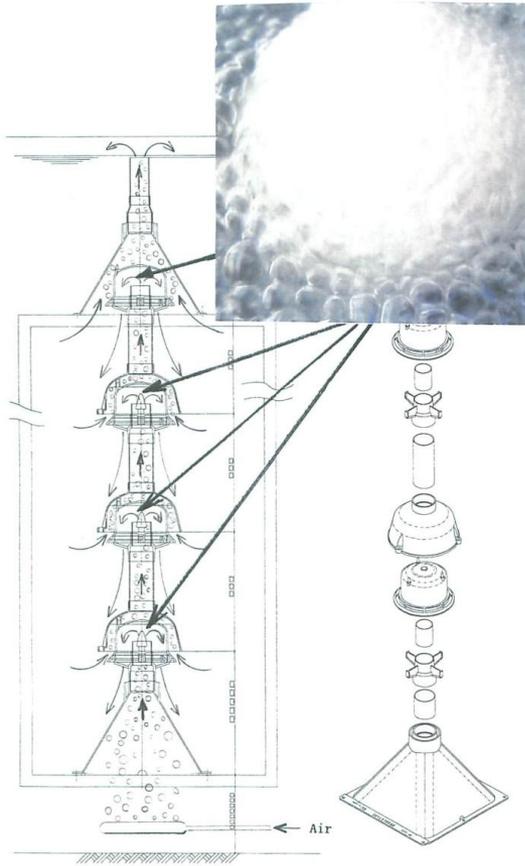
FB-50h



F.BT-50

AWA-200 LTF tower unit

equipped with diffuser at the bottom



AWA200(2 layer) aerator DO increase

Original conditions : 11 units of old fine bubble diffusers

DO : < 0.2ppm

Improved conditions : Replaced all old diffusers with 5 x AWA200 and 6 x new pulse diffusers (mixing of sludge)

DO : > 3ppm



Old fine bubble diffuser



Pulse diffuser

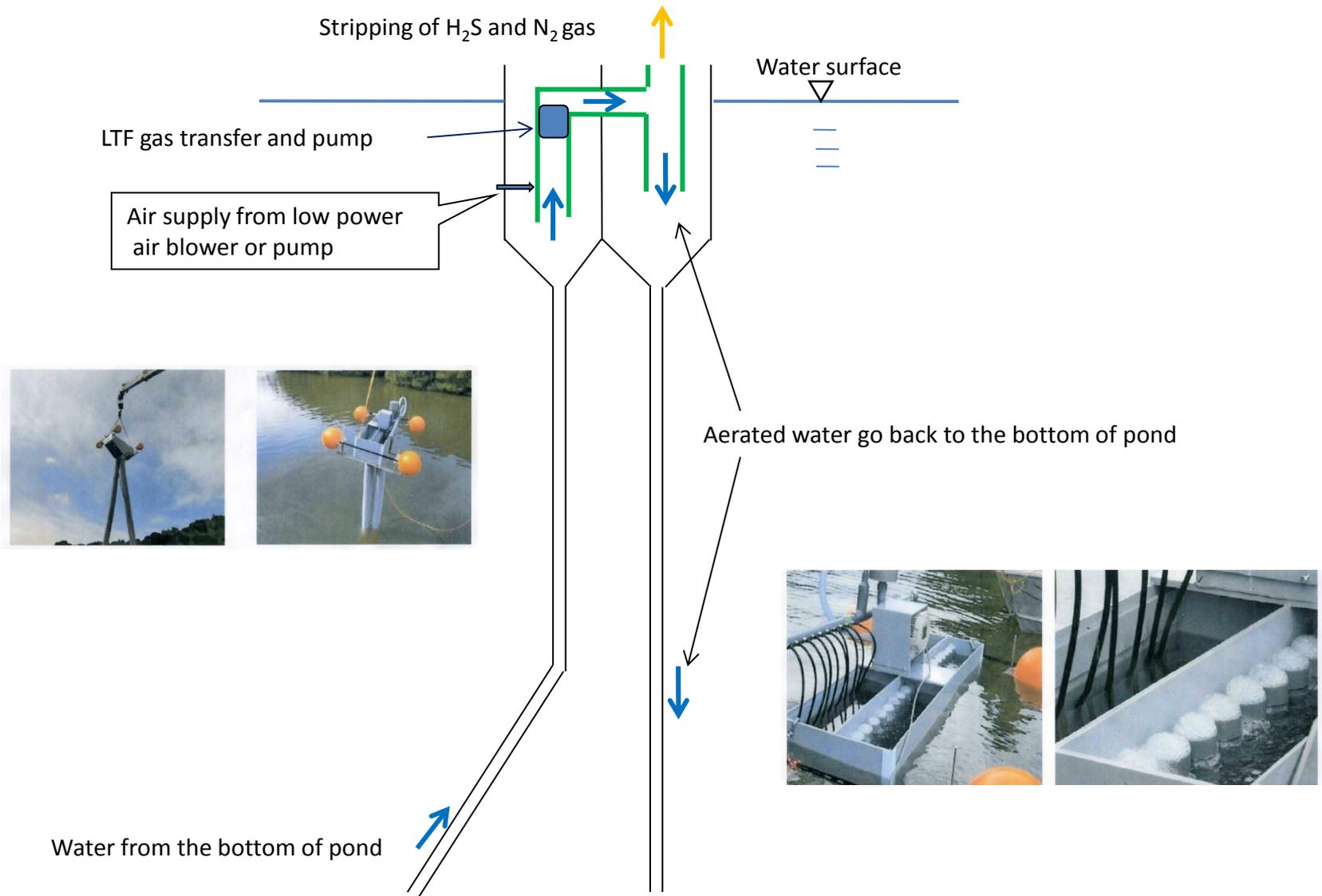


AWA200 (Two layer)

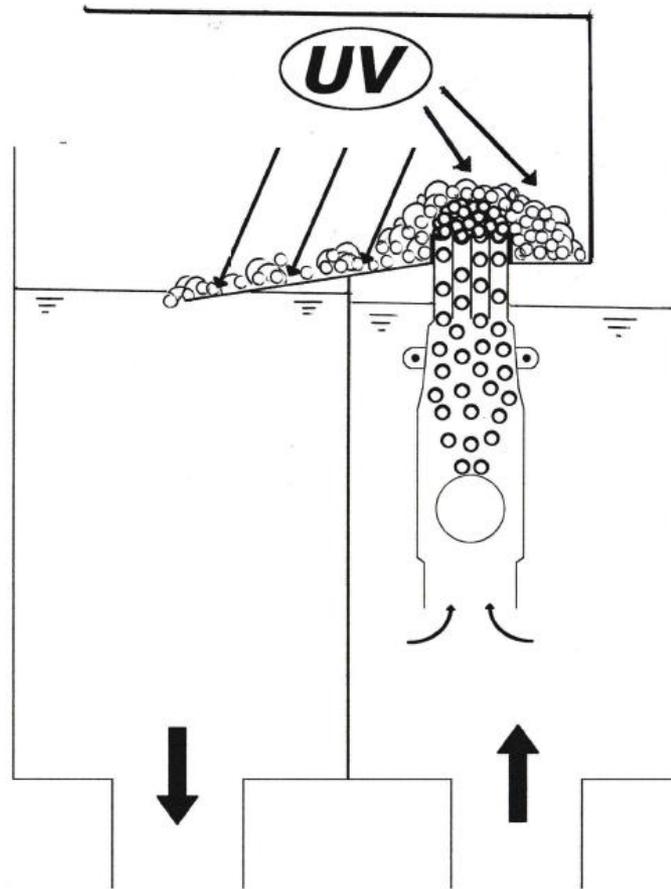


Inside of aeration tank

FB-50h aerator/pump for dam/pond



LTF – improve UV treatment efficiency



Application examples



Wastewater treatment, Aeration



Dam/pond water remedy



Still water aeration/circulation



Aquaculture/Hydroponics



Gas dissolution



Multiple FB-50 aerator/water circulator