Fine Bubble Technology

May 15, 2018

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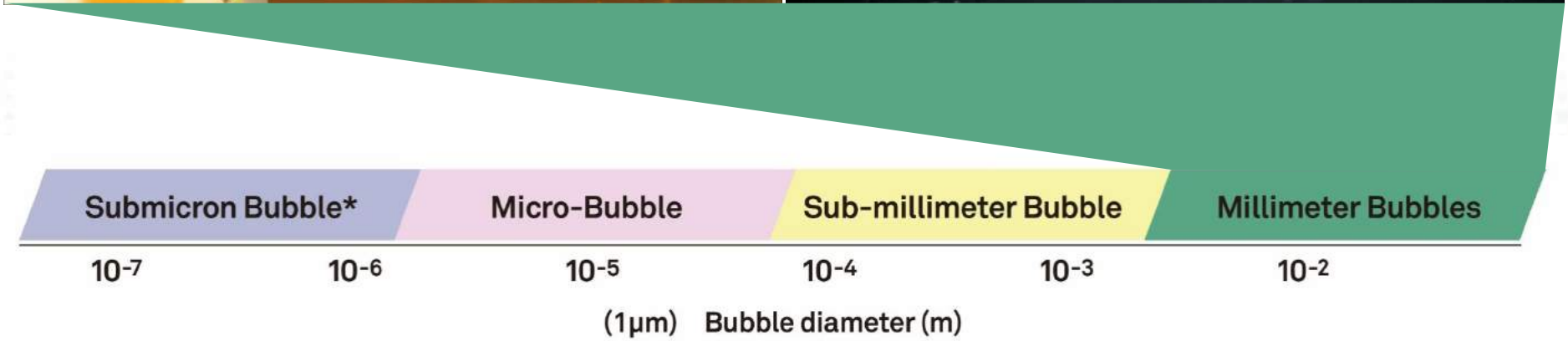
Chair of Japan National Mirror Committee of ISO/TC 281
Vice Chairman of Fine Bubble Industries Association (FBIA)
Senior Executive Officer, Chief Technology Officer, IDEC Corporation

Millimeter bubble (several mm Φ)

Milli-bubble

Milli-bubble

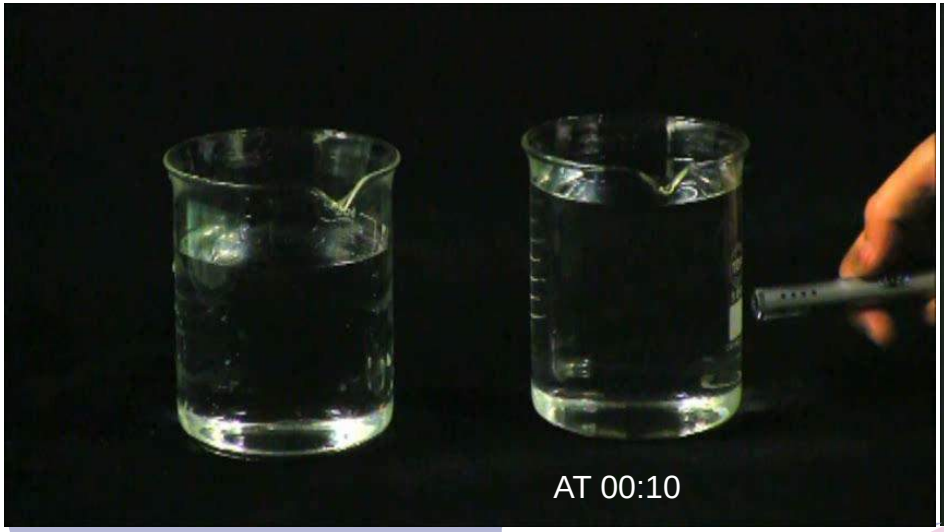


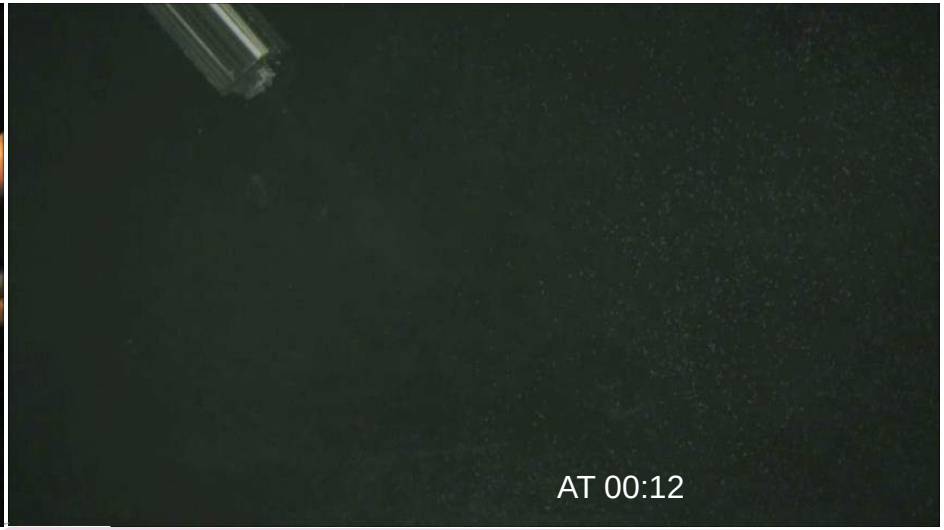
Micro bubble (several 10 μm Φ)

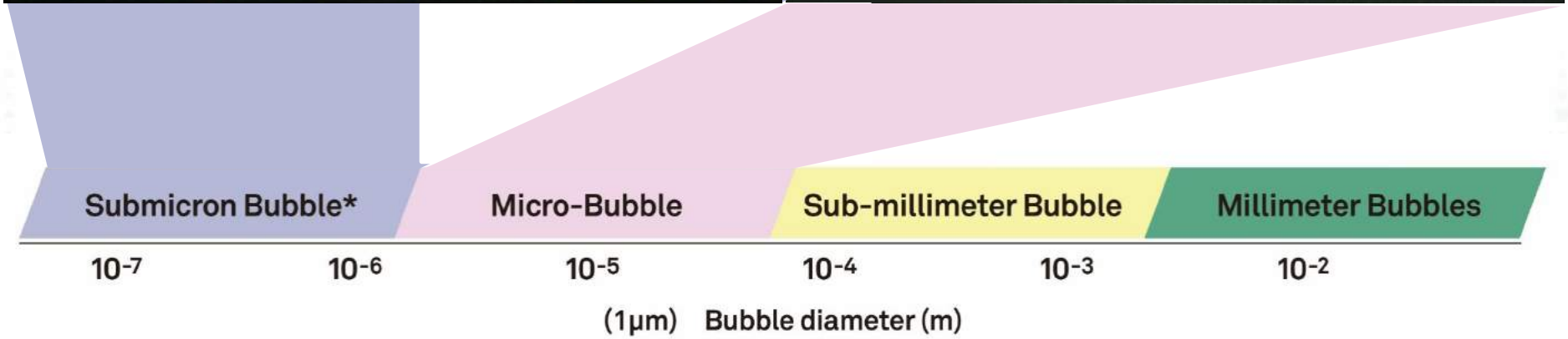
Ultrafine bubble
Contained ultra
pure water

Ultra pure water

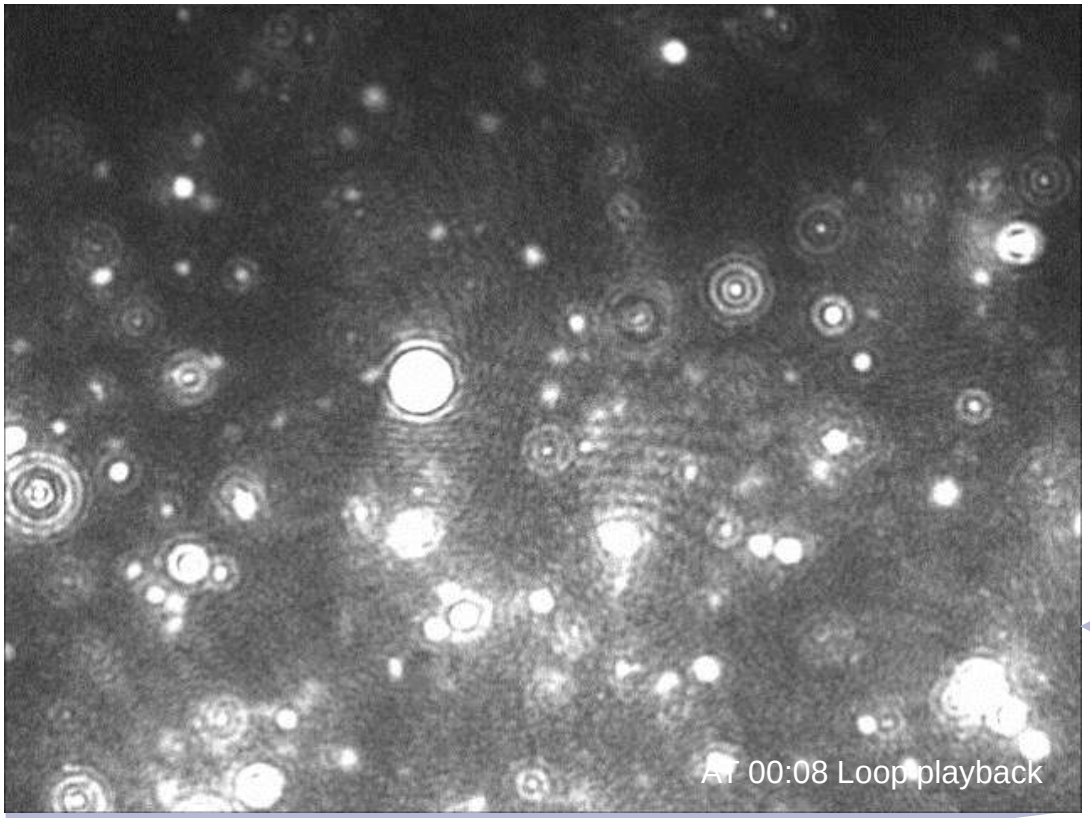
Micro bubble





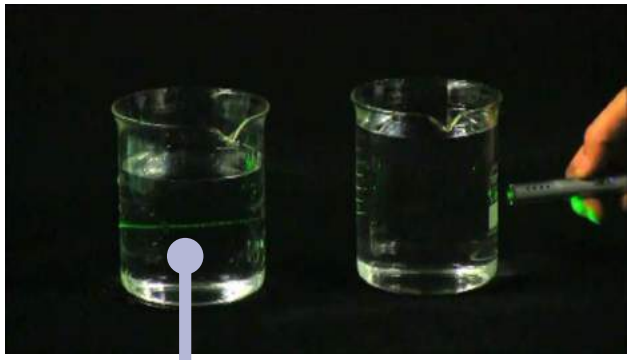


Ultrafine bubble （100~200nm Φ）



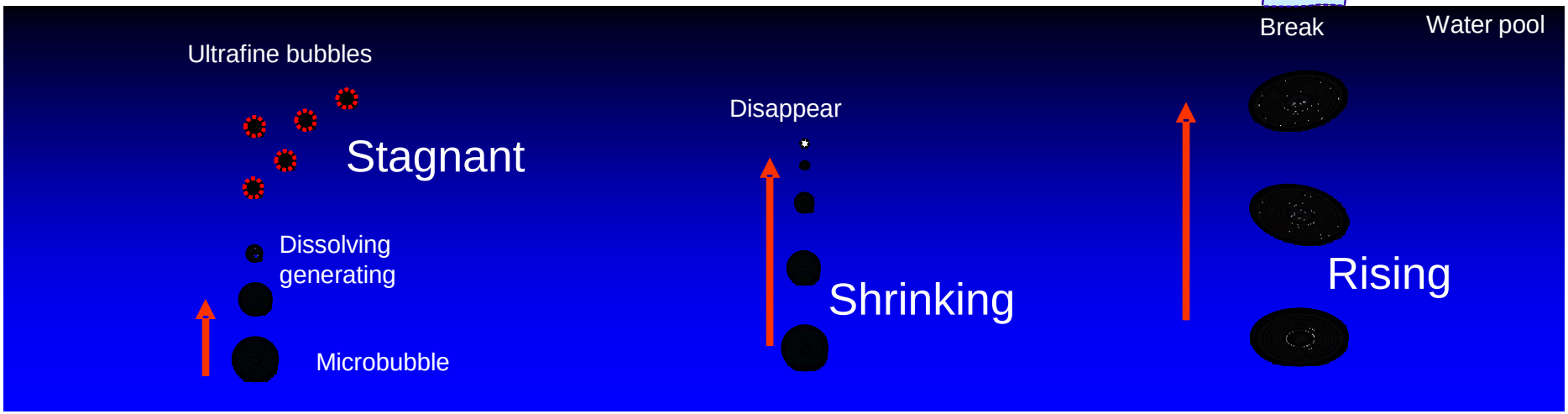
Ultrafine bubble
Contained ultra
pure water

Ultra pure water

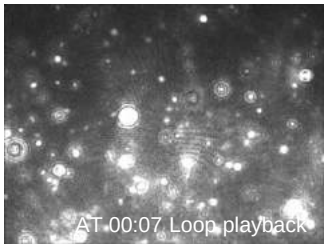


Ultrafine bubble
Diameter 100~200nm
Density 4 X10^9 / ml

Behavior of milli-, micro- and ultrafine-bubble



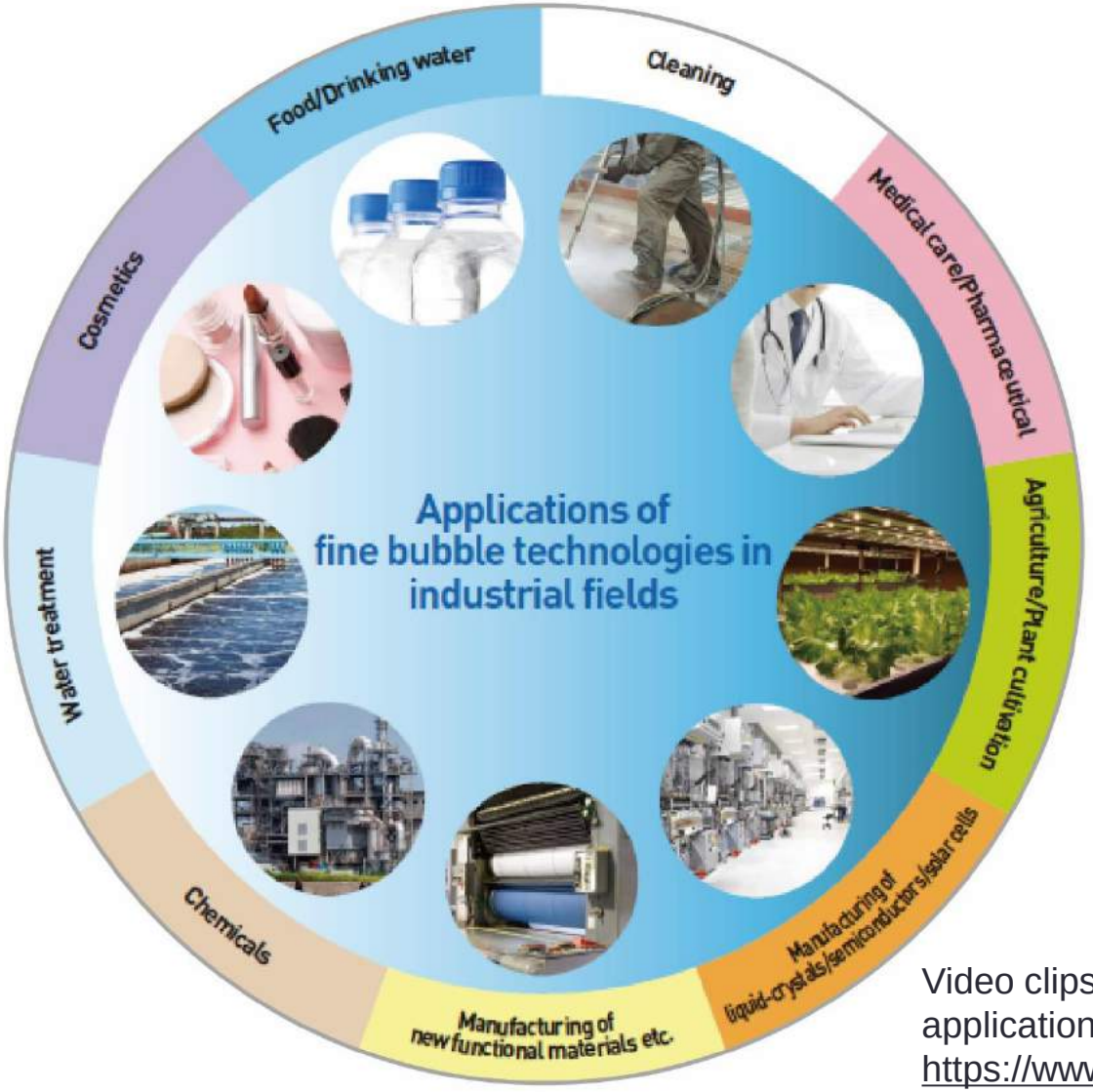
Ultrafine Bubble(100nm~200nm)

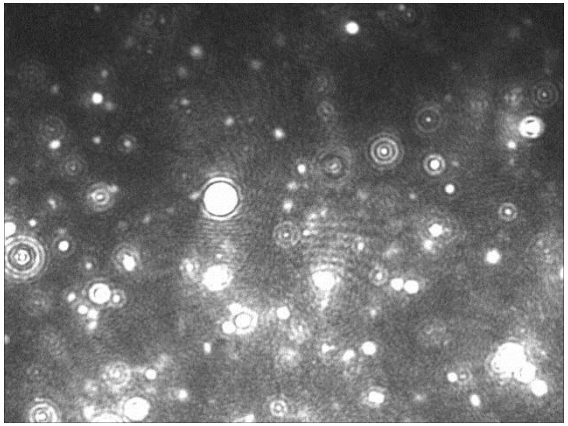


Micro Bubble(~50um)

Milli –Bubble(100um~1mm)

Various potential applications of Fine Bubble Technology





Video clips of actual examples of fine bubble applications are available to see on https://www.youtube.com/watch?v=lQkmFiJFnGI

Sustainable Development Goals (SDGs) in APEC

Transforming our World：the 2030 Agenda for Sustainable Development

FBT will contribute to achieve SDGs in various application field

FBT applications to cleaning fields

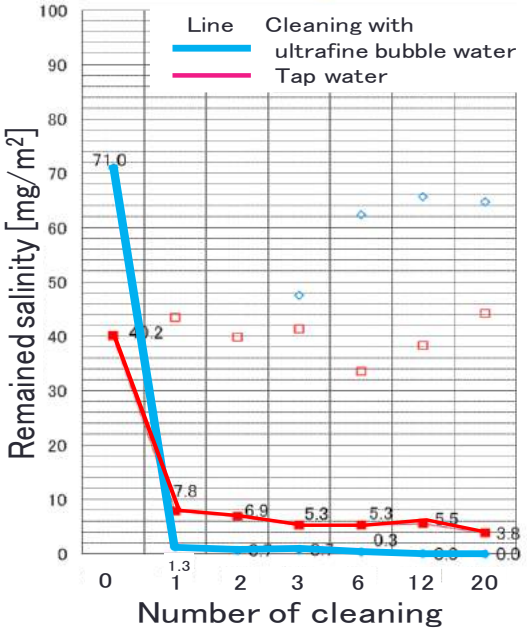
Application of ultrafine bubble water for cleaning of steel bridges（NEXCO-West Japan）

Japan

Salinity adsorbed on bridge wall before and after cleaning

Cleaning water	Tap water			Ultrafine Bubble water		
Cleaning position	Before cleaning	After cleaning	Cleaning rate [%]	Before cleaning	After cleaning	Cleaning rate [%]
Web face	60.9	10.9	82.1	136.9	1.5	98.2 Highly improved!
Upper face of bottom flange	57.4	4.8	91.6	190.9	0	100 Highly improved!
Weather	Sunny	Sunny		Sunny	Sunny	
Temperature [℃]	22	20		22	20	

Result



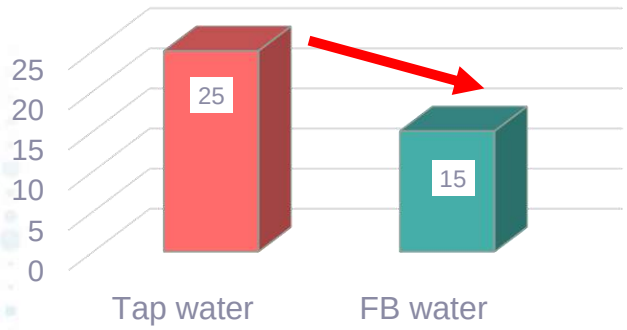
[Source: West Nippon Expressway Co., Ltd., Japan]

FBT applications to cleaning fields

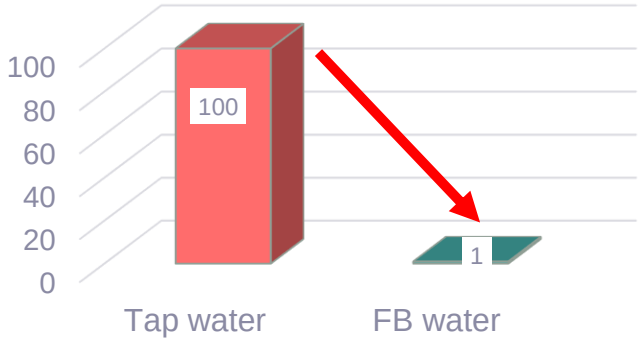
Cleaning on toilets

Japan

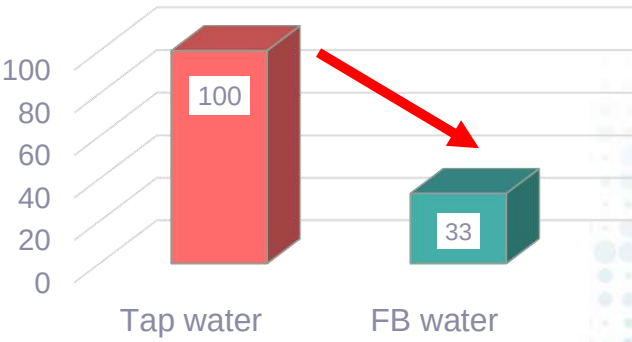
Cleaning time:
40% reduced



Water amount:
99% reduced



Detergent:
66% reduced

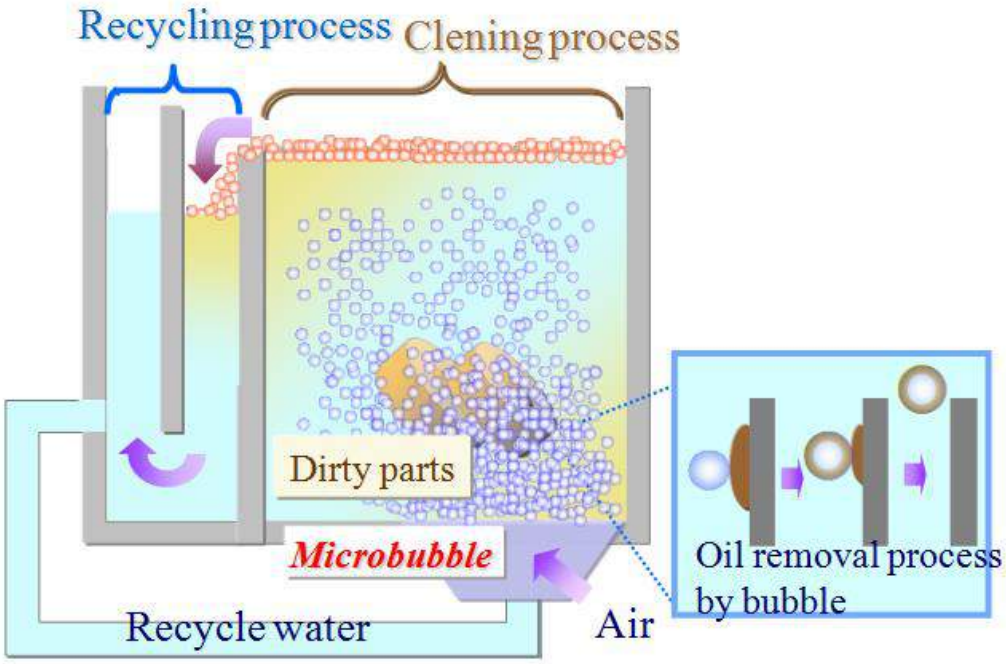


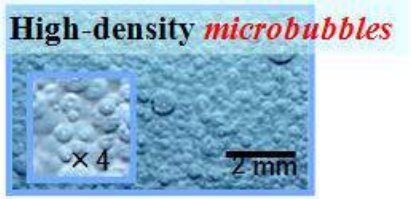
[Source: Ligaric Co., Ltd., Japan]

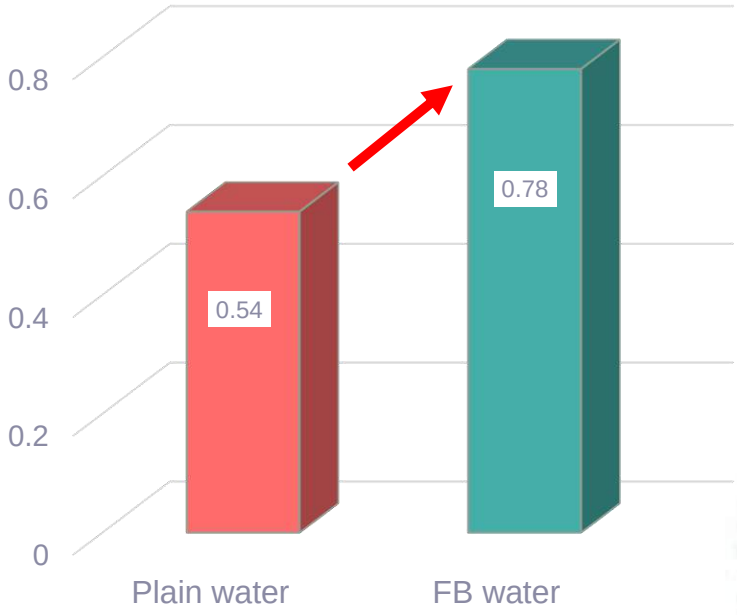
FBT applications to cleaning fields

■Application of fine (micro) bubble water for cleaning of machined parts (Mitsubishi Electric)

Japan







[Source: Mitsubishi Electric Corporation, Japan]

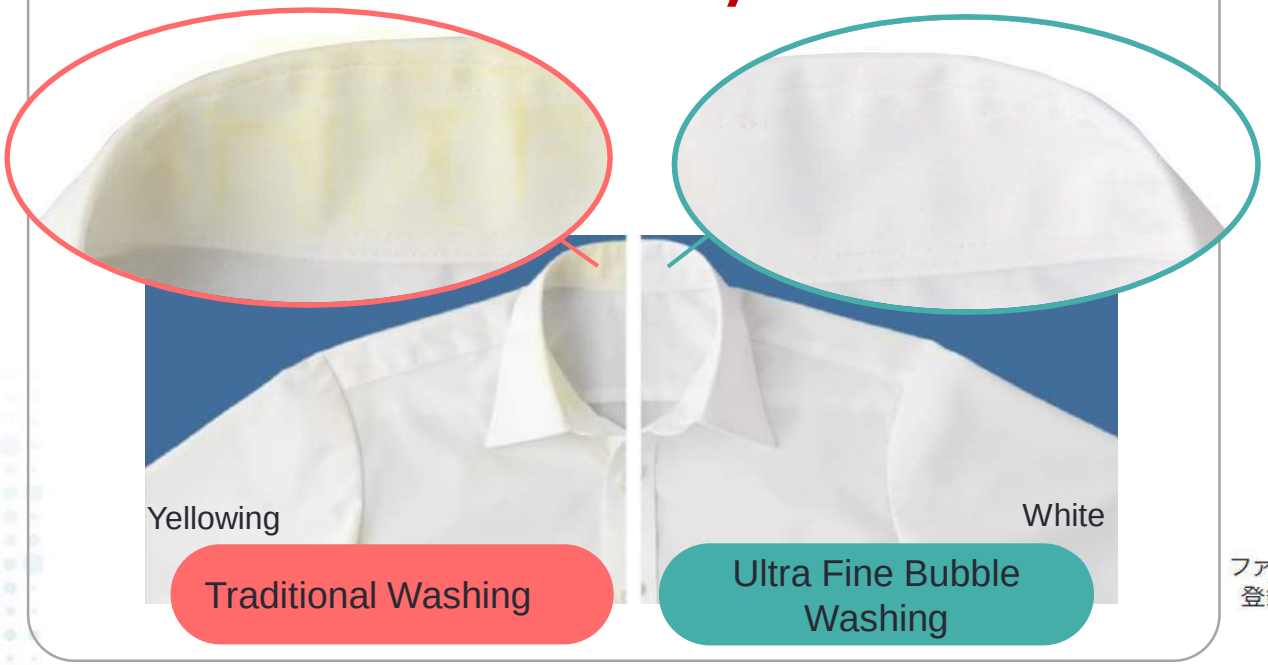
Japan

Ultra Fine Bubble Wash

Washing machine with ultra fine bubble technology

Suppresses the occurrence of yellowing by sebum

The whiteness continues after one year



ZABOON

FBIA

ファインバブル技術利用製品
登録番号：RWG1705001

Zaboon was registered as FB product by passing the examination of the propriety.

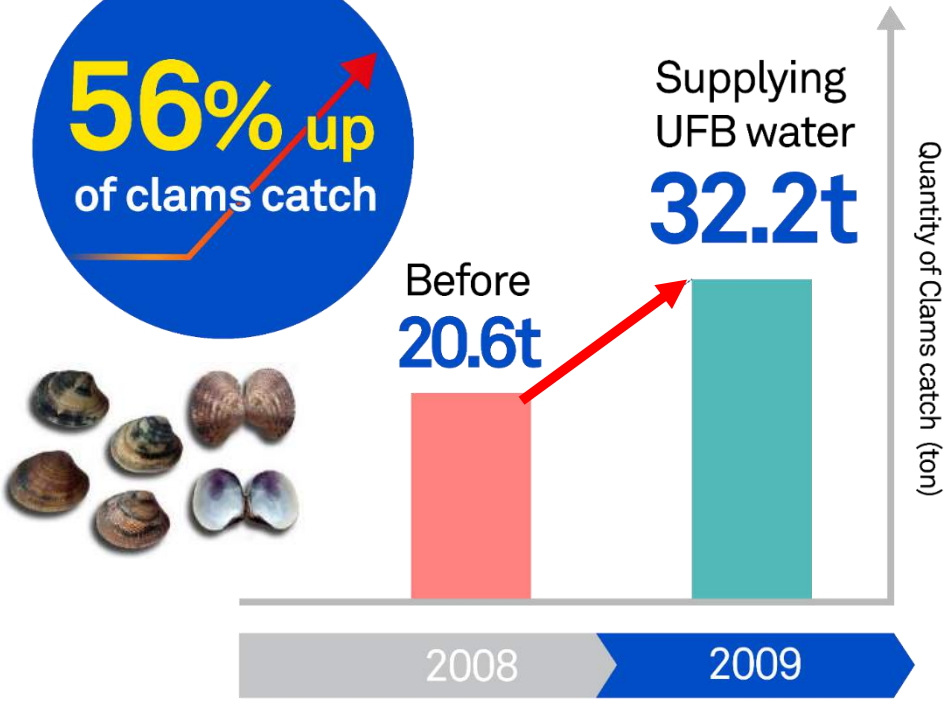
[Source: Toshiba Lifestyle Products & Services Corporation, Japan]

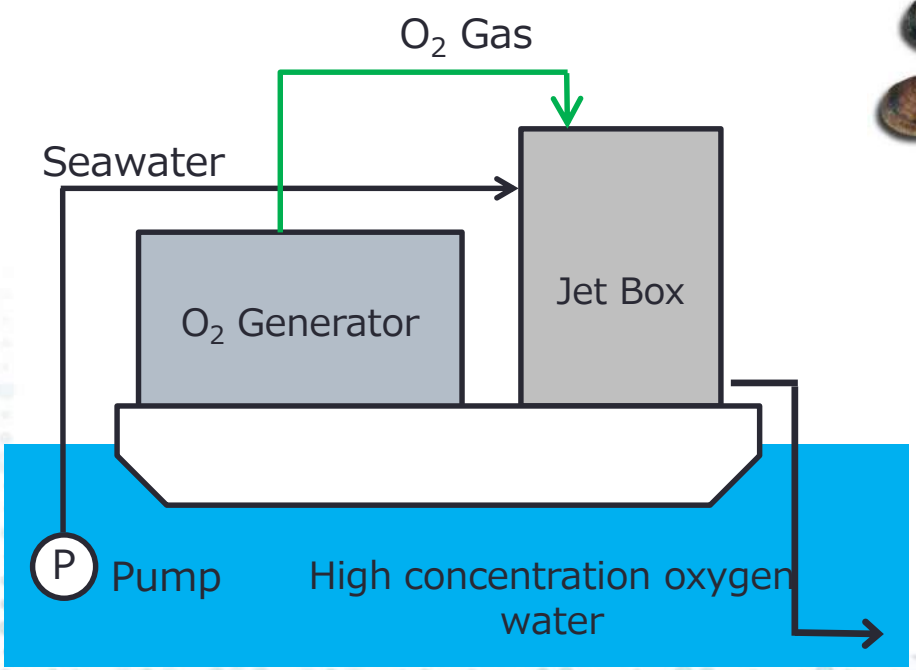
FBT applications to water treatment fields

Measures for hypoxic seawater in the gulf of Isahaya, Japan

Japan

56% up of clams catch



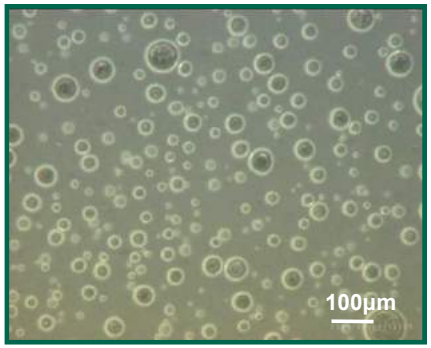


Hypoxic seawater was improved in 2009 and after then the DO level has been maintained every year.

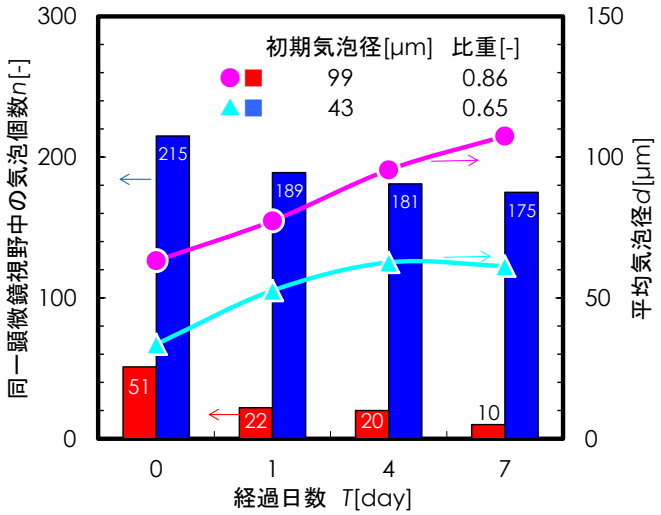
[Source: YBM Co., Ltd., Japan]

FBT applications to food fields: Mayonnaise

Mayonnaise with Fine Bubbles



Fine Bubbles in mayonnaise

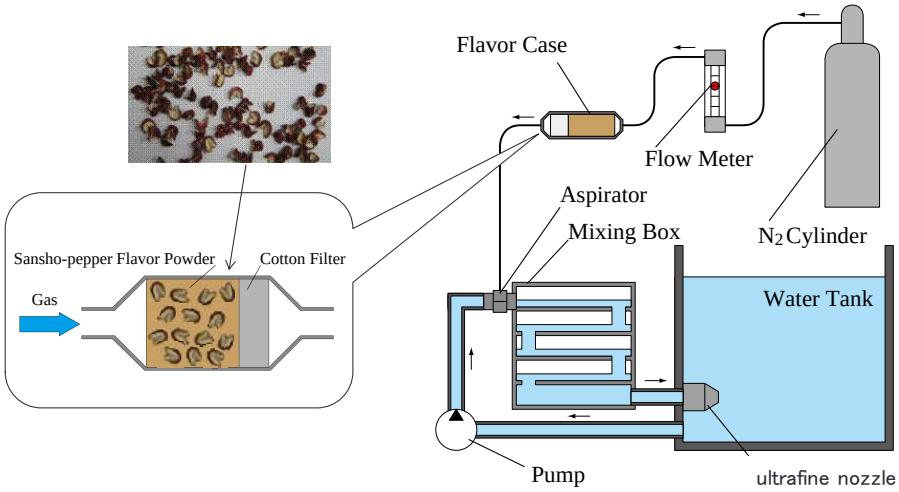


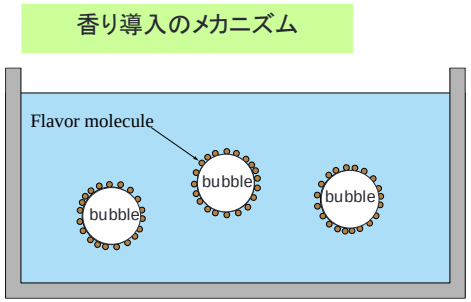
Stability of Fine Bubbles

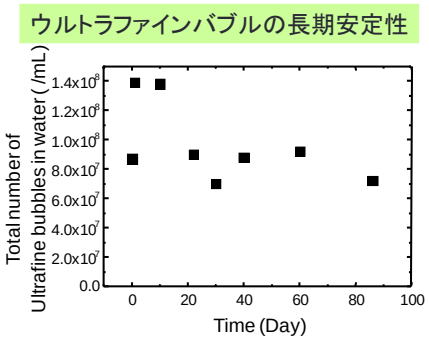
[Source: Kewpie, Japan]

FBT applications to food fields: Prickly ash

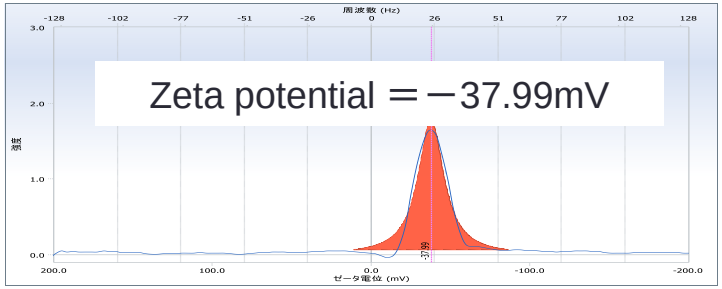
Production of water with flavor of prickly ash by ultrafine bubbles







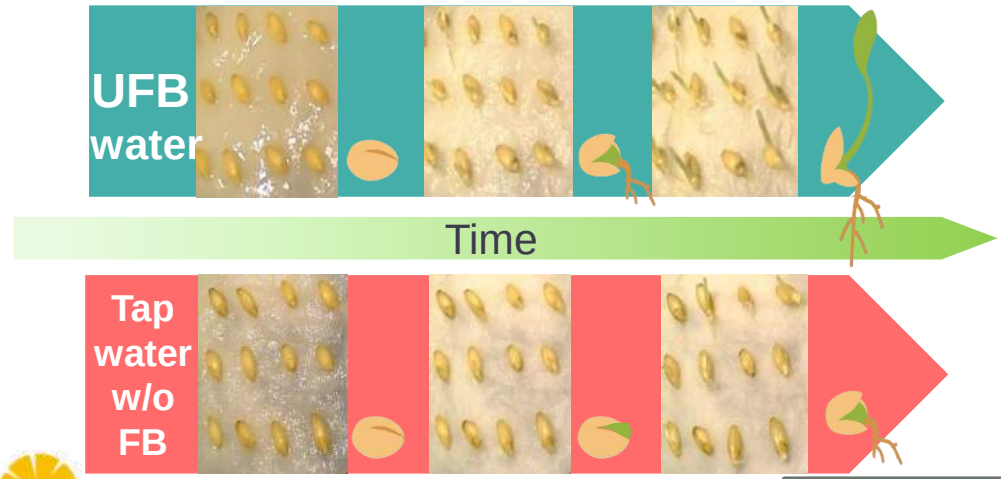
＜Zeta potential of Ultrafine bubble water＞



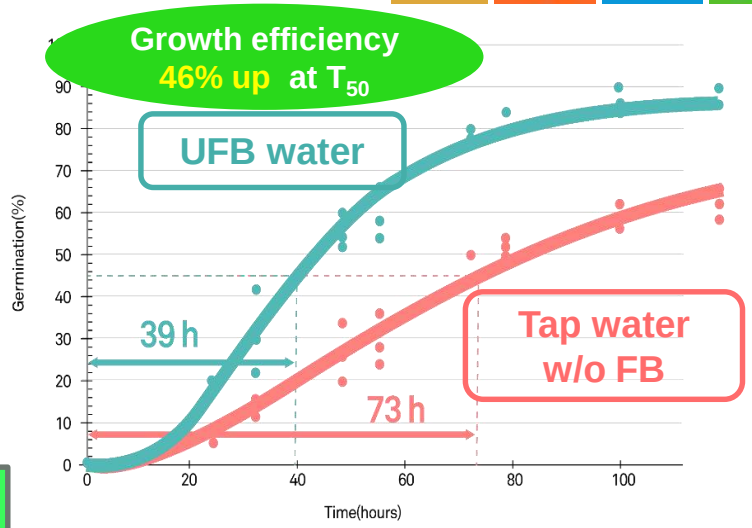
[Source: Kyoto University, IDEC, Japan]

FBT applications to agriculture fields: germination

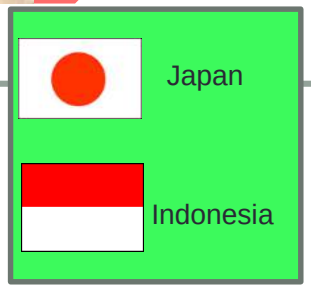
Barley germination promoted by UFB water



[Source: The university of Tokyo, Japan]

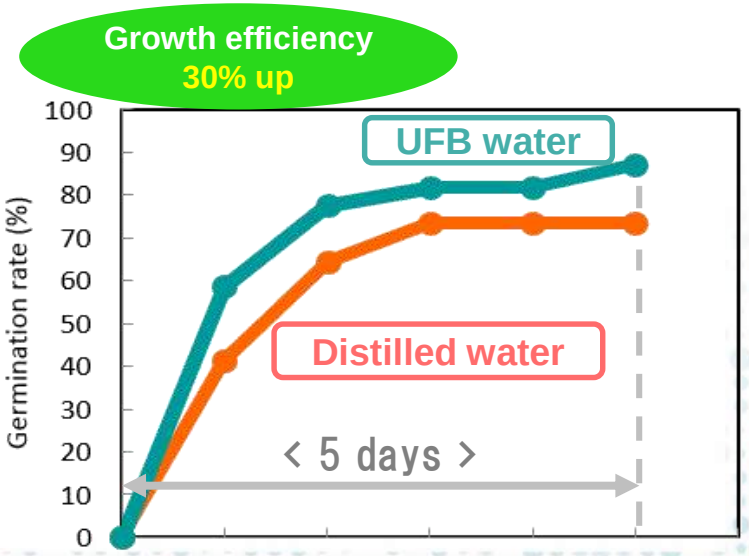


Soybean germination promoted by UFB water



UFB water

Distilled water



[Source: Bogor Agricultural University, Indonesia]

[Remarks] Acknowledgement to financial support by METI International Standardization Program in 2017, Japan

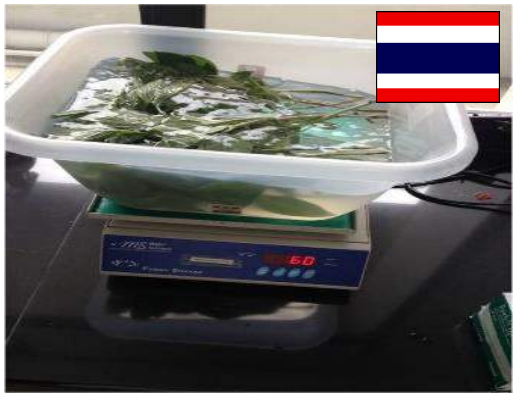
FBT applications to agro- & aqua-culture fields

Hydroponically grown lettuce

[Source: Mari's Garden, Hawaii, USA]

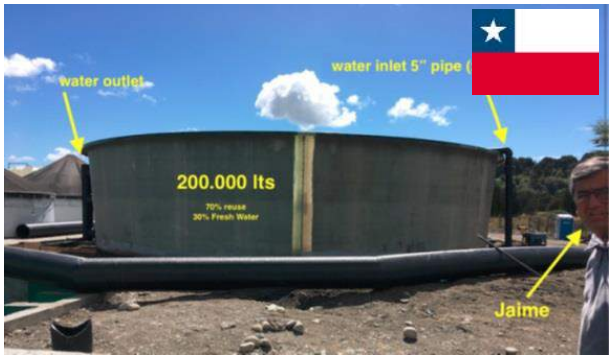
Plant Factory Lab

[Source: IDEC, Japan]



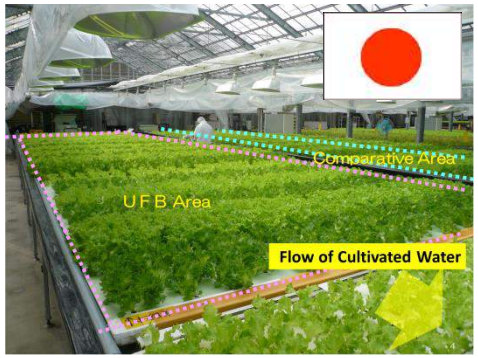
Sanitization of leafy vegetables

[Source: Kasetsart University, Thailand]



Huge salmon farming

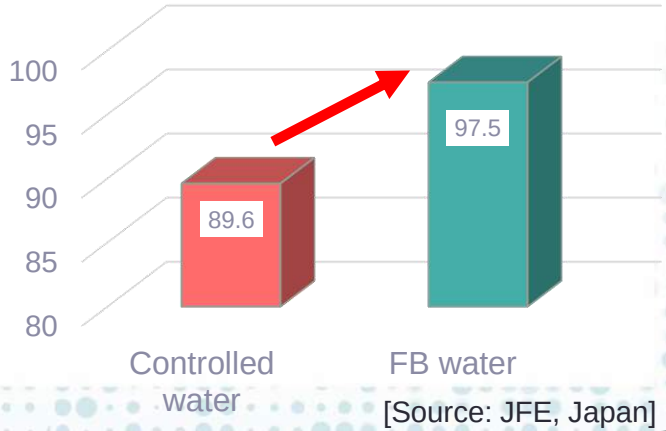
[Source: KRAN, Chile]



Plant Factory Lab

[Source: JFE, Japan]

Lettuce weight improved,
9% increase with FB water



[Source: JFE, Japan]

ISO/TC 281 Fine Bubble Technology

TC 281 structure

(as of May, 2018)

Secretariat: JISC
Chair: Stephen Ward-Smith
Secretary: Nobuhiro Aya

[Remarks: This TC setup was proposed by JISC and it started in 2013.]

P-members : 8 countries

- UK (Chair)
- Japan (Secretariat)
- China
- Russia
- Korea
- Singapore
- Australia
- USA

O-members : 12 countries

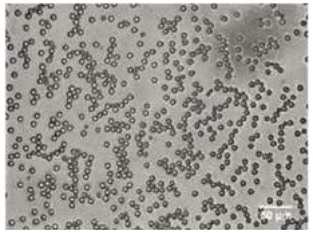
- Germany
- India
- Israel
- Netherlands
- Poland
- Czech Republic
- Finland
- France
- Argentina
- Viet Nam
- New Zealand
- Indonesia

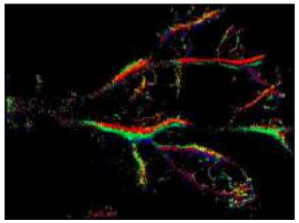
ISO/TC 281 standardizing situation:

- 1 published (ISO 20480-1:2017 Fine bubble technology -- General principles for usage and measurement of fine bubbles -- Part 1: Terminology)
- 14 under work program (including 3 DIS in progress)

FBT activities of P-members

Australia





Medical imaging (clinically approved in many countries)

[Source: Ultrasound contrast agent, Australia]

USA

Cleaning on hard floors

[Source: Tennant Co., USA]

China

Water treatment

[Source: Chinese Academy of Science, China]

Singapore

Tirapia growth

[Source: Temasek, SG]

Republic of Korea

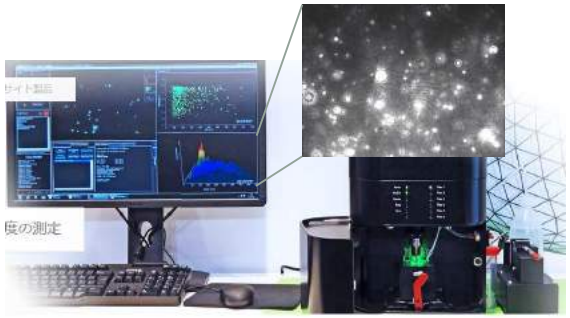
Pre-treatment of industrial waste waters

[Source: New Water Tec, Korea]

UK

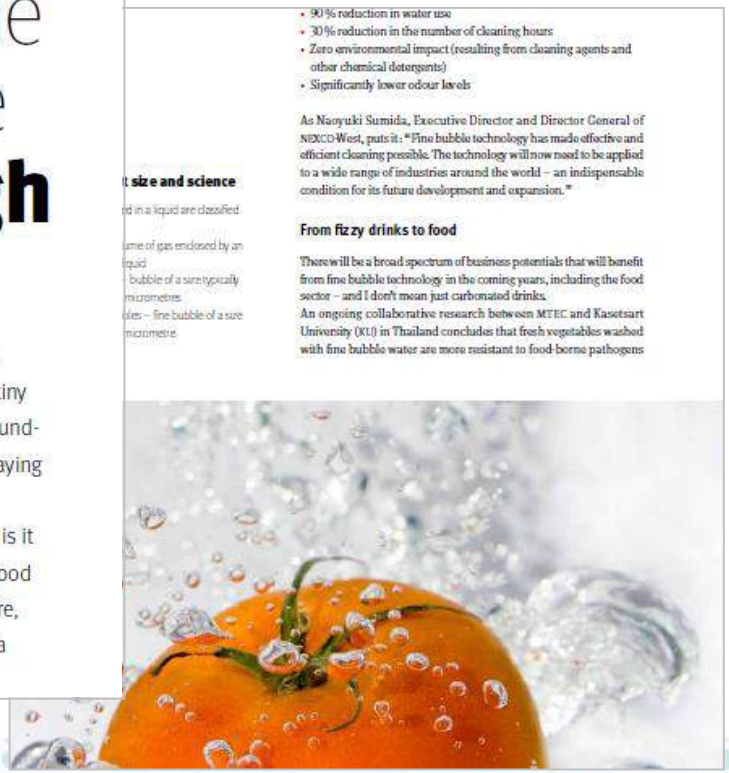
Russia

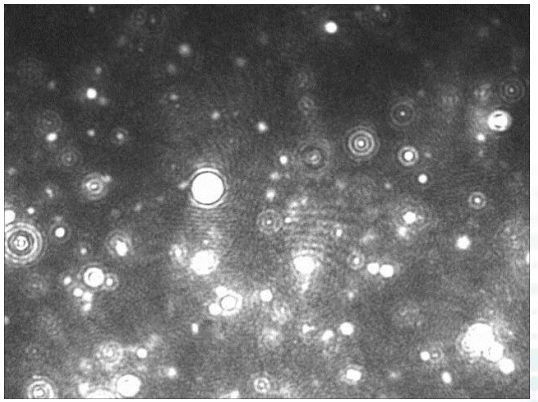
Measurement on FB test equipment



[Source: Malvern Ltd., UK / Newatertec, Russia]

Fine Bubble Technology introduced in ISO Focus May-June, 2014

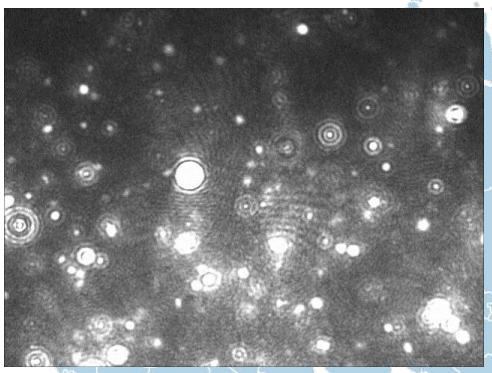




[Source: ISO]

Cooperation with PASC economies

Please join our activities and let's make a progress of FBT by the lead of PASC !



Canada

Mongolia

Republic of Korea

China

USA

Japan

Thailand

Mexico

India

HK. China

Viet Nam

Philippines

Colombia

Malaysia

Brunei

Ecuador

Indonesia

South Africa

Singapore

Papua New Guinea

Peru

Fiji

Australia

New Zealand

ISO

SUSTAINABLE DEVELOPMENT GOALS