

WEBINAR

Integrated Technology for Industry Wastewater Treatment and Zero Liquid Discharge

	Time (SGT)	Agenda	Presented by
	10.00am	Opening & Housekeeping rules	Singapore Water Association
	10.05am	Welcome Address	Mr. James Ow Chin Seng PBM Executive Chairman cum CEO of AnnAik Limited
	10.15am	Integrated Technology for Industry Wastewater Treatment and Zero Liquid Discharge	Dr. Raymond Yang General Manager/Director Pioneer Environmental Technology Pte Ltd
	10.45am	Q & A	Pioneer Environmental Technology Pte Ltd
	11.00am	Closing	Singapore Water Association

Housekeeping

- To ensure a smooth session, please mute your microphone and turn off the camera. You may communicate with us after the event.
- Please share your questions in the chat where we will try to provide answers where possible in the Q & A Segment.
- Do identify yourself so we can respond to any unanswered questions.
- ✓ We will be recording this session and reserve the rights to the video.
- Please complete a post event survey which upon return, we will forward the recording and presentation deck to the respondents.







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Welcome Address



Mr. James Ow Chin Seng PBM Executive Chairman cum CEO of AnnAik Limited

- Derived President of Singapore-China Business Association
- Vice-chairman of Trade Association and Membership of the Singapore Chinese Chamber of Commerce and Industry







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Keynote Speaker

Integrated Technology for Industry Wastewater Treatment and Zero Liquid Discharge



Dr. Raymond Yang

General Manager/Director Pioneer Environmental Technology Pte Ltd







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Integrated Technology for Industrial Wastewater Treatment and Zero Liquid Discharge



5th May 2021 (SWA Webinar)

Dr. Raymond Yang Pioneer Environmental Technology Pte Ltd (Singapore/Suzhou/Wuhan/Taian)

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(1) Singapore industry is fast growing, especially the pharmaceutical industrial after the COVID-19;

(2) 8 of the top 10 pharmaceutical companies have facilities in Singapore, manufacturing 4 of the top 10 drugs by global revenue [EDB website];

(3)Worldwide big players: GSK, MSD, Novartis, Pfizer, Roche, Amgen, Sanofi, Shire, etc.

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Image: Image

pharmaceutical output in singapo

Singapore factory output up 17.9% in November on pharma, semicon boom ...

 $24~{\rm Dec}~2020-{\rm SINGAPORE'S}$ factory output was back on track in November, after an earlier decline, as plants in the volatile pharmaceuticals segment ...

Sr https://www.straitstimes.com > phar...

Pharma industry drives rebound in factory output, Economy News & Top ...

25 Dec 2020 — ... coronavirus pandemic drew to a close, Singapore's manufacturing industry rebounded last month, partly because the pharmaceutical ...

https://www.straitstimes.com > singa...

Singapore pharma sector an 'increasingly important' part of ...

 $24\ {\rm Jul}\ 2019$ — That being said, the change in monthly pharmaceutical exports from Singapore can be volatile,...





▲ https://www.channelnewsasia.com › ...

Singapore's industrial production jumps 24.2% in September on strong ... - CNA

26 Oct 2020 — This was boosted by a 113.6 per cent spike in pharmaceutical output, on the back of higher production of active pharmaceutical ingredients ...

https://www.reuters.com > article

Pharma exports a rare bright spot for Singapore economy as pandemic ...

27 May 2020 — ... * Companies and governments worldwide stockpiling drug ingredients . * Singapore pharmaceutical output up 86% this year.

Related searches



Pharmaceutical industry plays more and more important roles in Singapore

(1)Pharmaceutical industry is generating more and more hazardous wastes, particular from production of active pharmaceutical ingredients (APIs);

- (2) Among the hazardous wastes, the most difficult-to-treat is wastewater with "4 highs", (High COD, High Salts, High Volatile and High Toxic Organics)
- (3) Conventionally, these wastewater is incinerated. However, due to the low heat value, the incineration cost is very high as additional fuel is needed for the incineration process. And also, the high salts content could lead to the choking for the incinerator and increase the maintenance cost.
- (4)Current treatment price for these wastewater is above S\$300/ton in Singapore market.
- (5) While biological treatment is very attractive due to its low cost, however, the toxic ingredients and high salts content make it difficult for bacteria to survive.

Examples for toxic chemicals - active pharmaceutical ingredients (APIs)







Conventional Wastewater Treatment Process

Clean Production and Waste Minimization from Sources – Novel Synthesis Methods, Onsite Wastewater Management & Treatment, Recycling.

- Wastewater Pretreatment Bar Screening, Oil & Grease Removal, Stripping, Evaporation, P/C Treatment, AOP, etc.
- Wastewater Biological Treatment Anaerobic & Aerobic (UASB, MBBR, MBR)
- Wastewater Post-Treatment, Polishing and Recycling AOP, Adsorption, Ion-exchange, UF & RO

? 🎝

High COD, High Salts, High Volatile and High Toxic Organics --- "4 Highs"



Stripping Column + MVR



High COD, High Salts, High Volatile and High Toxic Organics --- "4 Highs"



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Stripping Column + MVR

Why Stripping ?

- Use less steam to strip volatile organic compounds (VOCs) out
- The concentrated organic compounds can be reused or incinerated.

Why MVR?

Mechanical Vapor Recompression (MVR) is a proven energy-saving evaporative concentration technology to treat industrial wastewater, which reuses secondary steam instead of live primary steam so the energy is recovered.

In principle, there are only two types of COD: volatile and non-volatile;

The volatile organics can be removed by stripping column;

The non-volatile organics can be separated by evaporation or MVR process;

Most of the organics can be removed by the combination of stripping and evaporation processes;

The purified water is then treated by P/C treatment or biological process to meet discharge limits.

Solution Developed

Patented in China (Invention)





Integrated Technology for Treatment of Wastewater with "4 Highs" (High COD, High Salts, High Volatile and High Toxic Organics)

(54)发明名称

基于汽提和MVR组合工艺的处理化工废水的 系统及方法

(57)摘要

本发明公开了一种基于汽提和MVR组合工艺的处理化工废水的系统及方法,系统包括汽提单元和MVR单元,汽提单元包括汽提塔和冷凝器,MVR单元包括MVR预热器、MVR蒸发器、MVR压缩机以及MVR热交换器,汽提塔分别与冷凝器和MVR预热器连通,MVR预热器与MVR蒸发器连通,MVR预热器与MVR蒸发器连通,MVR蒸发器通过循环泵与MVR热交换器连通。本发明可将绝大部分的挥发性有机物和非挥发性有机物和无机物从化工废水中分离出来,经过处理后,任何高盐分,高COD,高挥发性和高毒性的有机废水得到有效的处理。

Patented in China (Invention)



Stripping Column for VOC Removal





Stripping Column - Principle



Stripping Process

> In a stripping process, steam is injected at the bottom of a column to provide heat and vapour, and the wastewater is fed at the top of the column.

➤ The combined effects of the steam and heat, or temperature cause organic material to transfer from the liquid to the vapour phase. The vapour phase becomes more enriched as it travels up the column. The vapour leaves the top heavily laden with organics and is condensed and collected.

➢ While wastewater stream is heated and put in intimate contact with steam, traveling down in a column, the wastewater becomes leaner in the organic material and cleaner at the bottom of the column.

Stripped wastewater

High VOC Removal Efficiency









MVR – Mechanical Vapor Re-compression



The vapor is re-compressed and the temperature is increased;

> The same vapor is re-used to evaporate the raw water and is condensed into liquid.

 \succ Hence, the energy is saved.

➢ For large plant, the energy consumption is about 10 kwh for evaporation of one m3 water.

For small plant, the energy consumption is about 50 kwh for evaporation of one m3 water.



Integrated Stripping Column-MVR Process Flow









Integration of stripping column and MVR - PLC



Integration of stripping column and MVR - PLC

4816mg1L
771 Vsomgll
MUR夜进水: 19560mg12
MUR 协调游 : 290 Komg/1
the .



WW - after SC - After MVR

Integration of stripping column and MVR COD reduced from 50,000 ppm-30,000 ppm to 1,000 - 5,000 ppm

Similar Results were obtained from other pharmaceutical wastewater treatment. Hence, this method is non-selective. unlike other selective treatment methods, such as AOP.

	COD	氨氮	总磷	总氮	PH
原水	143700	6.5433	9999	6.543	9
1	351400	3688	0	3688	10
2	2154	6.247	0.06	6.247	10
3	982.7	131.7	0.2	131.7	7
4	991.8	12.28	0.785	12.28	3
5	1044	0.245	0.892	0.245	3
6(残液)	423900	3773	2765	3773	1
L	以上实验是	取原水进行	常压蒸馏,	分段收集。	

With the effective pre-treatment, we have paved the way to treat the pharmaceutical wastewater with biological method.

Bird View of the Whole Biological Treatment Plant



Side View of the Plant



Wastewater Collection Tank & Micro-electrolysis Tank



Aerobic and Anaerobic Tank





Aerobic Tank (MBBR)





Aerobic Tank (MBR)





Piping Work





Chemical Dosing System



Air Blower and Filter Press



Control and On-line Monitoring System





<u>Stripping Column + MVR + Microelectrolysis +</u> <u>Anaerobic Process + MBBR + PTFE MBR</u>

Influent Parameters



Influent :

Volume:	300 m3/d			
COD:	> 50,000 ppm			
NH3-N:	> 200 ppm			
TN:	> 400 ppm			
TDS:	> 20,000 ppm			
With chemical intermediates,				
solvents, salts and other toxic				
chemicals				

Effluent Parameters



Effluent :

- COD: < 100 ppm
- NH3-N: < 25 ppm
- TN: < 40 ppm
- TDS: < 1,000 ppm



Integrated Technology for pharmaceutical Wastewater Treatment References in China: 3 Plants (Completed) > 20 Projects (in Discussions)



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While the technology was developed in China, we have started to apply it in the local market.



MVR with Largest Capacity in Singapore



















Na_2SO_4 Salt Recovered

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Integrated Hazardous Waste Management Centre - Designed for a China Plant. In future, we hope we can design a similar plant in Singapore



Featured Clients

Hazardous Wastes and Non-Hazardous Waste Disposal Center















Integrated Waste Management

Featured Clients

Pharmaceutical Industries





Allsino Chemicals Co., Ltd

Petrochemical

12 32

Chemical Logistics

Sludge Incineration







Featured Clients

Semiconductor & New Energy





ASM 🛞 Pacific Technology

Animal husbandry, Agriculture& Forestry









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Upcoming Events in May

1. <u>11th May (3pm – 4.30pm)</u> Water Resource Recovery.

A dialogue between Denmark and Singapore on key innovations and opportunities ahead in the water sector (The Royal Danish Embassy & Danish Export Assoc - Water).

2. <u>17th May (3pm – 4pm)</u>

Deepen Your Workforce Digital Capabilities with SME Digital Reboot.

3. <u>19th May (3pm – 4pm)</u>

SWA/SgWX Industrial Water Series.

Sharing of water opportunities in industrial projects in Philippines and Vietnam.

4. <u>21st May (3pm – 4pm)</u> SWA/SgWX Water Utilities Series.

Water Management & Strategies of the Metropolitan Waterworks Authority (MWA), Bangkok.

5. <u>27th May (3pm – 4.30pm)</u> Storming Innovations with SIMTech.

https://www.swa.org.sg/category/upcoming-events/

Thank you

For further queries on this event, please contact :





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