Kertas Bil. 16/2015

PENYATA JAWATANKUASA PILIHAN KHAS MENGENAI PENGURUSAN SUMBER AIR MENTAH SELANGOR (SELECT COMMITTEE ON RAW WATER RESOURCE MANAGEMENT OF THE STATE OF SELANGOR– JPK-SAM) BAGI DEWAN NEGERI SELANGOR BERHUBUNG PENCEMARAN AMMONIA DI LOJI RAWATAN AIR BATU 11 CHERAS DAN BUKIT TAMPOI DI SUNGAI LANGAT

Penyata oleh Jawatankuasa Pilihan Khas Pengurusan Sumber Air Mentah (JPK-SAM), Dewan Negeri Selangor berhubung "Pencemaran Ammonia Di Loji Rawatan Air Batu 11 Cheras dan Bukit Tampoi di Sungai Langat".

1. PENDAHULUAN

1.1. JPK-SAM telah mengadakan pendengaran tertutup pada 14hb Januari 2015, 21hb Januari 2015 dan 11hb Februari 2015 bagi menyiasat kejadian pencemaran Ammonia di Loji Rawantan Air (LRA) Batu 11 Cheras dan LRA Bukit Tampoi.

1.2 Pendengaran ini dibuat memandangkan kejadian ini berlaku berulangkali di mana ianya menimbulkan banyak kesulitan kepada rakyat Negeri Selangor pada sekitar Mac dan April 2014.

2. LATAR BELAKANG

2.1. Pada 27hb Januari 2014, 4hb Februari 2014, 10hb Februari 2014, 25hb Februari 2014, dan 14hb April 2014, LRA Batu 11 Cheras telah memberhentikan operasi kerana terdapat kenaikan paras ammonia melepasi paras yang dibenarkan.

2.2. Pada 29hb Januari 2014 dan 26hb Mac 2014, LRA Bukit Tampoi pula telah memberhentikan operasi kerana terdapat kenaikan paras ammonia melepasi paras yang dibenarkan.

2.3. Kedua-dua insiden pencemaran ini berlaku di Lembangan Sungai Langat.

3. AHLI JAWATANKUASA

3.1. Y.B. Puan Yeo Bee Yin
ADN Damansara Utama

3.2. Y.B. Tuan Mohd Shafie bin Ngah
ADN Bangi

3.3. Y.B. Tuan Dr Xavier Jayakumar a/l Arulanandam
ADN Seri Andalas

3.4. Y.B. Tuan Rajiv a/l Rishyakaran
ADN Bukit Gasing

3.5. Y.B. Tuan Idris bin Ahmad
ADN Ijok

3.6. Y.B. Tuan Sulaiman bin Abdul Razak
ADN Permatang

3.7. Y.B. Tuan Jakiran bin Jacomah
ADN Bukit Melawati

4. SAKSI-SAKSI TERLIBAT:

4.1. Senarai saksi-saksi yang hadir pada Pendengaran Tertutup bertarikh 14hb Januari 2015, 21hb Januari 2015 dan 11hb Februari 2015 adalah seperti di Lampiran I.

5. FAKTA KEJADIAN

5.1. Antara bulan Januari hingga April pada tahun 2014, LRA Batu Cheras telah ditutup sebanyak 5 kali, manakala LRA Bukit Tampoi terpaksa ditutup sebanyak 2 kali akibat pencemaran ammonia.

5.2. Menurut Unit Perancang Ekonomi Negeri (UPEN) pelepasan air sebanyak 260mld sehingga 350mld dari Empangan Sg Langat tidak dapat melarutkan ammonia semasa musim kering 2014 menyebabkan operasi pusat rawatan air diberhentikan. Mereka tidak dapat melepaskan jumlah air yang lebih tinggi untuk mencairkan paras ammonia yang terlalu tinggi iaitu pada kadar 7-10 mg/l air kerana risau paras air dalam empangan yang menyusut.

5.3. Kronologi kejadian pencemaran air menurut LUAS adalah seperti berikut:

Tarikh	Kejadian
28/1/14	Henti tugas LRA Batu 11 Cheras pada jam 10.15 pagi oleh kerana peningkatan paras ammonia sehingga 6.3mg/l.
29/1/14	Henti tugas LRA Bukit Tampoi pada jam 3.15 petang oleh kerana peningkatan paras ammonia sehingga 6.2mg/l.
2/2/14	LRA Batu 11 Cheras beroperasi pada jam 8.45 malam dengan bacaan ammoni <2mg/l.
4/2/14	LRA Batu 11 Cheras dihenti tugas semula pada jam 8.00 pagi dengan bacaan ammonia 6.4mg/l.
7/2/14	LRA Batu 11 Cheras beroperasi pada jam 12.15 tengahari apabila bacaan ammonia <2mg/l.
10/2/14	LRA Batu 11 Cheras dihenti tugas semula pada jam 9.00 pagi dengan bacaan ammonia 4.16mg/l.
17/3/14	LRA Batu 11 Cheras beroperasi semula pada jam 7.00 malam apabila bacaan ammonia <2mg/l.
19/3/14	LRA Bukit. Tampoi beroperasi semula pada jam 2.00 petang apabila bacaan ammonia <2mg/l.
25/3/14	LRA Batu 11 Cheras dihenti tugas semula pada jam 2.00 petang dengan bacaan ammonia >4mg/l.
26/3/14	LRA Bukit. Tampoi dihenti tugas semula pada jam 8.00 pagi apabila bacaan ammonia menunjukkan 2.8mg/l.
30/3/14	LRA Bukit. Tampoi beroperasi semula pada jam 10.00 pagi dengan bacaan 1.4mg/l dan LRA Batu 11 Cheras pada jam 12.00 tengahari dengan bacaan <1.5mg/l.
14/4/14	LRA Batu 11 Cheras kembali henti tugas pada jam 3.00 petang dengan bacaan ammonia 4.57mg/l.
16/4/14	LRA Batu 11 Cheras kembali beroperasi dengan bacaan ammonia <1.5mg/l.

6. PUNCA PENCEMARAN

6.1. Walaupun pelepasan kebanyakan Loji Rawatan Kumbahan (LRK) di sekitar Lembangan Sungai Langat adalah di bawah piawaian yang ditetapkan, kadar kepekatan ammonia Sungai Langat telah meningkat kepada 2-10 mg/l kerana kekurangan pencairan akibat musim kering yang berlanjutan. Lampiran II menunjukkan bacaan paras ammonia dalam air di LRA Batu 11 Cheras dan LRA Bukit Tampoi ketika insiden ini berlaku.

6.2. Tahap kepekatan ammonia yang boleh diabstrakkan atau dirawat oleh LRA adalah 3mg/l.

6.3. Menurut Jabatan Alam Sekitar (JAS), punca pencemaran ammonia di Lembangan Sungai Langat adalah pelbagai seperti yang ditunjukkan di Jadual 6.3.1.

6.3.1. Jumlah Anggaran Beban Pencemaran Dari Pelbagai Sumber – Lembangan Sg Langat (Study On Pollution Prevention and Water Quality Improvement Programme of Sg. Langat July 2003)

PUNCA PENCEMARAN	BEBAN AMMONIA (KG/DAY)	PERATUS %
Industri	1513	6.82%
Pasar Basah	56	0.25%
Loji Kumbahan Awam	3071	13.84%
Loji Kumbahan Swasta	645	2.91%
Tangki Septik Individu	2784	12.55%
Tapak Pelupusan	664	2.99%
Kuari Pasir	57	0.26%
Penternakan	725	3.27%
Kawasan Perbandaran, Pertanian, Air Larian Dll	12670	57.2%
JUMLAH	**22185**	**100%**

6.4. Menurut JAS, kajian beban pencemaran tidak dikemaskinikan kerana ia melibatkan agensi kerajaan persekutuan dan lain-lain. Ia juga memerlukan kebenaran di bawah peruntukan Rancangan Malaysia ke-9. Selepas kajian bertarikh 2003 diselesaikan, tiada lagi peruntukan diberikan oleh Kerajaan Persekutuan. LUAS mengatakan kajian ini boleh dilakukan semula tetapi JAS

mengatakan bahawa kajian sebegini adalah sangat terperinci dan menelan belanja yang tinggi.

6.5. Jumlah peratus pencemaran berkaitan dengan kumbahan adalah lebih kurang 30%, iaitu Loji Kumbahan Awam 13.84%, Loji Kumbahan Swasta 2.95% dan Tangki Septik Individu (IST) 12.55%.

6.6. Tangki Septik Individu (IST)

6.6.1. Tangki septik adalah sesuatu bentuk kemudahan rawatan asas atas tapak yang terdiri daripada satu petak atau lebih yang menyediakan rawatan kumbahan melalui proses pemendapan dan anaerobik.

6.6.2. Mengikut Pekara 65 (1) (c) Akta Industri Perkhidmatan Air (WASIA) 2006, pemilik IST hendaklah bertanggungjawab sepenuhnya bagi penyelennggaraan, pembaikpulihan atau penggantian perpaipan pebetungan dalaman IST.

6.6.3. Sebelum WASIA, IST adalah diuruskan oleh Indah Water Konsortium (IWK) dengan sepenuhnya.

6.6.4. IST hendaklah dinyahlumpurkan (*de-sludge*) setiap 2-3 tahun. Sejak perlaksanaan WASIA, menurut JAS hanya kurang daripada 5% IST telah dinyahlumpurkan[1].

6.7. LRK Awam bermaksud dibawah kawal selia IWK manakala LRK swasta adalah dibawah kawal selia persendirian.

6.8. Di Lembangan Sungai Langat terdapat 8,341 IST, 82 LRK persendirian dan 652 LRK awam.

6.8.1. Pecahan Bilangan IST dan Loji Persendirian untuk Bukit Tampoi

No	Tempat Tadahan	Jumlah IST	Jumlah LRK Persendirian
1	Kajang 1 & 3	1,611	3
2	Kajang 2	1,093	6

[1] Ramai Masih Tidak Peka Kepada Pengosongan Tangki Septik." Suruhanjaya Perkhidmatan Air Negara (SPAN) 29 Nov 2011. 6 Mac 2015. <
http://www.span.gov.my/index.php?option=com_content&view=article&id=417%3Amany-are-still-unaware-of-the-need-to-desludge-their-septic-tanks&lang=bahasa>

[2] Mukasurat 74, Hansard Dewan Negeri Selangor bertarikh 15hb April 2014 < http://dewan.selangor.gov.my/assets/pdf/Hansard/2014/Sesi-1/07.HANSARD.150414.pdf > :

"Y.B. PUAN ELIZABETH WONG KEAT PING: Terima kasih Tuan Timbalan Speaker, saya hanya ingin jawab secara ringkas 2 perkara yang dibangkitkan oleh Dengkil juga Hulu Kelang. Soalan Dengkil adalah adakah kita ada penyelesaian kepada isu ammonia, jawapannya adalah ya. Cadangan telah diberi kepada loji syarikat yang mengendalikan loji pembersihan air untuk menggantikan filter dengan media sodium allumino silicate di mana ianya bakal mengurangkan kadar ammonia di dalam air mentah dan kos keseluruhan bagi cadangan tersebut adalah RM5 juta dengan anggaran tempoh kerja penggantian dan pemasangan antara 6 hingga 8 bulan. Pada masa yang sama, penyelesaian jangka masa panjang long term solution dengan

No	Tempat Tadahan	Jumlah IST	Jumlah Persendirian	LRK
3	Kajang 3	1,562	26	
4	Cheras Batu 11	3,491	18	
5	Cheras Jaya	262	1	
6	Bandar Baru Bangi	322	28	
TOTAL		8,341	82	

6.8.2. Jumlah LRK mengikut Kategori

	Lembangan Sg. Langat
	Bil
Kategori 1 -Loji dibina selepas tahun 2009, direka untuk mematuhi kualiti piawai terbaru (BOD:20mg/L, COD:120mg/L, NH_3N:10mg/L, NO_3N:20mg/L) – Dilengkapi dgn 'tertiary treatment' untuk menapis Ammoniacal Nitrogen (NH3N) dan Nitrate Nitrogen (NO3N)	36
Kategori 2 -Loji dibina sekitar tahun (1999-2009) –Tanpa Kelengkapan untuk Menapis NH3N dan NO3N	266
Kategori 3 -Loji dibina sebelum tahun 1999 kebanyakannya di bawah kawal selia PBT sebelum di serahmilik kepada IWK –Tanpa Kelengkapan untuk Menapis NH3N dan NO3N	350
Jumlah Loji	652

6.9. Projek Rasionalisasi

6.9.1. Projek Rasionalisasi yang dilaksanakan oleh Kementerian Tenaga, Teknologi Hijau dan Air (KeTHHA) di Lembangan Sungai Langat akan *phase-out* 166 STP kategori 2 dan 3 dan dengan ini mengurangkan kandungan ammonia daripada pelepasan STP.

6.9.2. Jawatankuasa difahamkan oleh IWK bahawa Fasa 1 akan siap 2017 dan mampu berkhidmat untuk 400,000 akaun di kawasan sekitar Cheras Jaya dan dijangka siap sepenuhnya pada 2020 di kawasan sekitar Bukit Tampoi (970,000 akaun).

6.9.3. Walau bagaimanapun, penyelesaian sementara untuk mengatasi pencemaran ammonia perlu diambil.

6.9.4. LUAS telah mencadangkan tiga cara penyelesian.

7. CADANGAN PENYELESAIAN SEMENTARA

7.1. Cadangan Penyelesaian Sementara Pertama LUAS: Penggantian Penapis di LRA

7.1.1. Sejak pihak Kerajaan Negeri membentangkan mengenai penapis pada 15hb April 2014[2] di Dewan, penapis telah pun menjadi jawapan Kerajaan Negeri kepada soalan-soalan yang ditanya mengenai cara penyelesaian pencemaran ammonia.

7.1.2. Jawatankuasa mendapati daripada penerangan-penerangan yang diberikan oleh LUAS, JAS, dan UPEN bahawa tiada tindakan bahkan tiada sebarang kajian semula dilakukan.

7.1.3. Jawatankuasa hanya mendapati bahawa kaedah ini tidak dapat dilaksanakan setelah pendengaran tertutup bertarikh 11hb Februari 2015 kerana mengikut saksi-saksi:

i. Ianya tidak efektif secara teknikal
ii. Penapis sepatutnya dipasang di dalam LRA yang bukan aset Kerajaan Negeri tetapi masih di bawah kawalan syarikat konsesi sehingga penstrukturan industri air dimuktamadkan

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[2] Mukasurat 74, Hansard Dewan Negeri Selangor bertarikh 15hb April 2014 < http://dewan.selangor.gov.my/assets/pdf/Hansard/2014/Sesi-1/07.HANSARD.150414.pdf > :

"Y.B. PUAN ELIZABETH WONG KEAT PING: Terima kasih Tuan Timbalan Speaker, saya hanya ingin jawab secara ringkas 2 perkara yang dibangkitkan oleh Dengkil juga Hulu Kelang. Soalan Dengkil adalah adakah kita ada penyelesaian kepada isu ammonia, jawapannya adalah ya. Cadangan telah diberi kepada loji syarikat yang mengendalikan loji pembersihan air untuk menggantikan filter dengan media sodium allumino silicate di mana ianya bakal mengurangkan kadar ammonia di dalam air mentah dan kos keseluruhan bagi cadangan tersebut adalah RM5 juta dengan anggaran tempoh kerja penggantian dan pemasangan antara 6 hingga 8 bulan. Pada masa yang sama, penyelesaian jangka masa panjang long term solution dengan izin ialah untuk menunggu, masalahnya kita terpaksa menunggu satu sistem integrated sewerage treatment plan di bina di Kawasan Langat tersebut kerana sekarang ada projek di bawah Kerajaan Pusat dan dijangka akan habis hanya pada tahun 2017. Jadi, penyelesaian yang paling bagus adalah untuk seperti yang saya sebut iaitu untuk menggantikan filter di loji pembersihan air."

7.1.4. Jawatankuasa ini berpendapat bahawa pihak Kerajaan Negeri sepatutnya mengambil tindakan selaras dengan apa dibentangkan di Dewan.

7.1.5. Jawatankuasa amat memandang berat isu ini.

7.2. Cadangan Penyelesaian Sementara Kedua LUAS: Tangki Rawatan Awalan (pre-treatment)

7.2.1. Dicadangkan satu sistem rawatan awalan (*pre-treatment*) air sungai sebelum proses rawatan di loji. Sistem ini menggunakan pandangan teknikal daripada Prof Dr. Azmi dari UTM.

7.2.2. Air mentah daripada sungai akan dipam masuk ke dalam tangki yang mengandungi bebola Cosmoball bagi mengurangkan kepekatan kandungan parameter ammonia sebelum dipam masuk ke dalam proses rawatan di LRA.

7.2.3. Rawatan ammonia menggunakan sistem ini memerlukan tempoh masa takungan (retention time) - pergerakan Cosmoball di dalam air di tangki tersebut dapat mengurangkan kepekatan ammonia. Peratus pemecahan bergantung kepada masa air berada di tangki sebelum disalurkan ke LRA. (Lampiran III - Kajian Teknikal Cosmoball)

7.2.4. Menurut Pegawai Operasi IWK, pengalaman IWK di Langat dan Semenyih menggunakan Cosmoball menunjukkan pengurangan ammonia sebanyak 14% di LRK. Keluasan tanah yang diperlukan adalah sedikit. Pada tahun 2012, mereka telah menggunakan produk Zerolite untuk mengurangkan kadar kandungan ammonia. Kesan pengurangan juga sebanyak 15%.

7.2.5. Menurut LUAS, sekiranya sistem ini digunakan di LRA dan bukan LRK, pengurangan 70-80% ammonia boleh dicapai.

7.2.6. Tempoh masa untuk pembinaan sistem rawatan ini adalah selama 6 bulan.

7.2.7. Butiran kos cadangan ini adalah seperti berikut :

BIL	PERKARA	KOS (RM)
1.	Menaiktaraf tangki rawatan dan kerja M&E berkaitan. Kerja termasuk membekal dan memasang 2 unit ROL	1,210,000.00

BIL	PERKARA	KOS (RM)
	tank 600m3, perpaipan, sistem kawalan automatik, penggalak udara, dan membekal cosmoball untuk tingkatkan keberkesanan tangki pengudaraan.	
2.	Merekabentuk, membekal dan memasang peralatan M&E termasuk 2 unit pam selam dari sungai, 2 unit pam selam untuk proses pengudaraan dan lain-lain peralatan termasuk kerja-kerja awam, ujian dan 12 bulan penyelenggaraan.	647,000.00
		1,857,000.00

7.2.8. Bagi sumber bekalan elektrik untuk sistem ini, terdapat dua (2) cadangan yang boleh dipertimbangkan iaitu :

i. Mendapatkan bekalan elektrik daripada sistem bekalan elektrik di LRA

ii. Menggunakan 2 set generator (genset) dengan kos RM 150,000 seunit untuk setiap LRA. Anggaran kos operasi bagi pembelian minyak diesel adalah RM 50,000 sebulan.

7.2.9. Jawatankuasa difahamkan kertas kerja telah hampir disiapkan dan akan dibentangkan kepada Kerajaan Negeri. [Semasa taklimat MTES pada 5hb Mac 2015 Jawatankuasa difahamkan bahawa kertas kerja ini telah dibentangkan oleh Lembaga LUAS].

7.3. Cadangan Penyelesaian Sementara Ketiga LUAS: Terowong Langat II

7.3.1. Menurut Y.B. Tuan Zaidy bin Abdul Talib, Jawatankuasa difahamkan bahawa sumber air mentah sebanyak 500mld akan disalurkan dari Pahang dengan Terowong Langat II untuk membantu pencairan paras ammonia dalam Sungai Langat.

7.3.2. Berikut adalah pengiraan jangkaan penurunan paras ammonia dengan tambahan air mentah daripada Terowong Langat II :

LRA	ALIRAN AIR SUNGAI KETIKA PARAS RENDAH	BACAAN AMMONIA (mg/l)	+ 500 mld	PERATUS TAMBAHAN ALIRAN AIR SUNGAI (%)	BACAAN AMMNONIA (mg/l)
BATU 11 (27 mld)	45 mld	2.4		1100	< 0.1

BUKIT TAMPOI (31 mld)	864 mld	5.3	57 Dikira hanya 30 % dengan faktor jarak yang jauh	3.7 (melebihi had ammonia 3.0 mg/l)

* Data diambil berdasarkan bacaan pada 7 Februari 2014
* Pengiraan dikira dengan mengambil kira air dilepaskan daripada empangan seperti biasa

7.3.3. Menurut UPEN, tambahan 500mld dari Terowong Langat II adalah mencukupi untuk memberikan kesan terhadap pengurangan paras ammonia dalam sungai.

8. PENEMUAN JAWATANKUASA

8.1. Jawatankuasa mendapati bahawa Lembangan Sungai Langat adalah terdedah kepada pencemaran ammonia kerana jumlah LRK dan IST yang banyak di sepanjang sungai tersebut.

8.2. Jawatankuasa mendapati bahawa langkah-langkah yang diambil oleh Kerajaan Negeri belum cukup berkesan dalam mengatasi masalah pencemaran ammonia yang berlaku berulang kali.

8.3. Jawatankuasa mendapati bahawa penyelesaian sementara wajar dilaksanakan dengan segera sebelum Projek Rasionalisasi Kumbahan oleh Kerajaan Persekutuan disiapkan.

9. SARANAN JAWATANKUASA

9.1. Jawatankuasa mencadangkan supaya tindakan serta merta diambil oleh Kerajaan Negeri untuk mengatasi masalah pencemaran ammonia kerana ianya memberikan kesan yang buruk kepada rakyat dan ekonomi Negeri. Kerajaan Negeri hendaklah mepertimbangkan dengan serius setiap cara penyelesaian yang dicadangkan oleh LUAS.

9.2. Memandangkan IST menyumbangkan sehingga 12% pencemaran, Jawatankuasa mencadangkan supaya Kerajaan Negeri Selangor mengadakan kempen secara proaktif untuk pemilik rumah supaya menyahlumpur (de-sludge) tangki septik mereka yang sepatutnya dilakukan 2 atau 3 tahun sekali.

9.3. Untuk mengendalikan masalah pencemaran dengan lebih baik dan mengoptimakan pelepasan air untuk pelarutan bahan pencemaran, Jawatankuasa mencadangkan supaya Kerajaan Negeri mempercepatkan Projek LUAS untuk memasang tolok pengukur sepanjang sungai di lembangan-lembangan utama Selangor. Dengan adanya tolok pengukur (gauges) dan Integrated Water Resources Information Management System (IWRIMS) yang sudah sedia dimiliki oleh LUAS, kualiti air mentah boleh dipantau secara lebih sistematik dan tindakan kecemasan boleh diambil dengan lebih cepat.

9.4. Jawatankuasa mencadangkan Kerajaan Negeri supaya menambah pakar-pakar air dalam agensi-agensi kerajaan untuk menangani masaalah pencemaran.

9.5. Jawatankuasa mencadangkan supaya Kerajaan Negeri memperkasakan LUAS dengan menambah anggota penguatkuasa.

9.6. Jawatankuasa mencadangkan supaya Kerajaan Negeri memantau dengan lebih baik projek rasionalisasi kerajaan persekutuan supaya mencapai sasaran rancangannya (target) mengikut jadual.

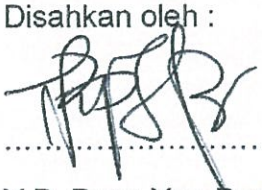
9.7. Jawatankuasa mencadangkan supaya Kerajaan Negeri mencari penyelesaian untuk menyelesaikan masalah kandungan ammonia tinggi di LRK-LRK kategori 2 dan 3 sebelum Projek Rasionalisasi siap:

9.7.1. Sama ada memberikan insentif kepada pemilik-pemilik LRK untuk mengambil tindakan yang sesuai untuk mengurangkan kadar kandungan ammonia; ataupun

9.7.2. Mencari jalan untuk mengenakan piawaian yang lebih tinggi terhadap LRK Kategori 2 dan 3 termasuk membuat pindaan undang-undang.

Penyata ini telah disediakan oleh Y.B. Puan Yeo Bee Yin, Pengerusi Jawatankuasa JPK-SAM, telah dibincangkan dan diluluskan oleh Jawatankuasa JPK-SAM di mesyuarat Jawatankuasa pada 5hb Mac 2015.

Disahkan oleh :



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Y.B. Puan Yeo Bee Yin

Pengerusi Jawatankuasa Pilihan Khas Mengenai Pengurusan Sumber Air Mentah Negeri Selangor.

URUS SETIA:

1. Pn Elya Marini binti Darmin	Setiausaha Bahagian Dewan/MMKN
2. En Mohd Khairul Ashraff bin Radzali	Ketua Penolong Setiausaha
3. Encik Jurasmaidi bin Pauzi	Penolong Setiausaha
4. Cik Azira binti Aziz	Penyelidik Kanan
5. Puan Nor Hafiza binti Ishak	Penolong Pegawai Tadbir

LAMPIRAN I

Bil. 2/2015

Tarikh	:	**14 Januari 2015 (Rabu)**
Masa	:	**2.30 petang**
Tempat	:	**Bilik Mesyuarat Kemboja** **Bahagian Pengurusan Sumber Manusia** **Tingkat 3, Bangunan SSAAS**

Jabatan yang dijemput:

Lembaga Urus Air Selangor (LUAS)

1. Tuan Haji Md Khairil bin Selamat
   (Pengarah)

2. Puan Norfazilah binti Shaharudin
   (Pegawai undang-Undang)

3. Encik Ishak bin kamaruzaman
   (Pegawai Penerangan)

4. Encik Mohd Nazifi bin Nawawi
   (Pegawai Kawalan Alam Sekitar)

Jabatan Pengairan Dan Saliran Negeri Selangor

1. Encik Roslan bin Shamsuddin
   (Jurutera Daerah)

2. Encik Zainudin bin Ali
   (Penolong Pengarah (Banjir))

3. Encik Khairul Adzim bin Saadon
   (Penolong Pengarah (Sungai))

Jabatan Alam Sekitar Negeri Selangor

1. Puan Siti Zaleha binti Ibrahim
   (Pengarah)

2. Encik Amirul bin Aripin
(Ketua Penolong Pengarah)

3. Puan Rosni binti Ismail
(Ketua Penolong Pengarah)

Indah Water Konsortium Sdn. Bhd

1. Ir. Mohd taufik bin Salleh
(Pemangku Pengurus Wilayah Tengah)

2. Encik Hussain bin Omar
(Pengurus Unit Operasi, IWK Langat)

3. Encik Mohamed Nor Faiz
(Bahagian Perancangan IWK)

4. Puan Azura bin Megat Ibrahim
(Bahagian Perancangan IWK)

LAMPIRAN IA

Bil. 3/2015

Tarikh	:	**21 Januari 2015 (Rabu)**
Masa	:	**2.30 petang**
Tempat	:	**Bilik Mesyuarat MTES** **Tingkat Bawah, Bangunan SSAAS**

Jabatan yang dijemput:

Seksyen Makro DanPenswastaan, Unit Perancang Ekonomi Negeri (UPEN)

1. Encik Nor Azmie bin Diron
   (Timbalan Pengarah)

2. Puan Mazidah binti Ahmad Ramli
   (Ketua Penolong Pengarah)

3. Encik Mohd Muktafi bin Sarpan
   (Penolong Pengarah)

Jabatan Pengairan Dan Saliran Negeri Selangor

1. Encik Roslan bin Shamsuddin
   (Jurutera Daerah)

2. Encik Zainudin bin Ali
   (Penolong Pengarah (Banjir))

3. Encik Khairul Adzim bin Saadon
   (Penolong Pengarah (Sungai))

Lembaga Urus Air Selangor (LUAS)

1. Tuan Haji Md Khairi bin Selamat

2. Encik Ishak bin Kamaruzzaman
   (Pegawai Penerangan)

3. Puan Norfazilah bin Shaharudin
   (Pegawai Undang-undang)

Syarikat Pengeluar Air Selangor (SPLASH)

1. Puan Sharifah Alauyah binti Wan Othman
   (Pengurus Besar)

2. Encik Mohd Hafiz bin Md Yunus
   (Pengurus Operasi)

3. Encik Azman bin Abdul Aziz
   (Pengurus Loji SSP3, Bukit Badong)

4. Encik Noorazlan bin Mesuan
   (Pengurus Loji SSP3, Rasa)

5. Encik Mohd Zaki Al-Hassan bin Mohamed Amran
   (Pengurus Loji SSP1)

Jawatankuasa Pemantauan Air Selangor

1. Encik Khairy bin Yeob

2. Encik Mansor bin Abd Ghani
3. Encik Mohmed Asari bin daud
4. Encik Mohamad Sarbani bin Che Noh
5. Encik Mohamad Yazid bin Selamat
6. Encik Abdul Karim bin Endut

LAMPIRAN IB

Bil. 4/2015

Tarikh	:	**11 Februari 2015 (Rabu)**
Masa	:	**2.30 petang**
Tempat	:	**Bilik Mesyuarat MTES** **Tingkat Bawah, Bangunan SSAAS**

Jabatan yang dijemput:

Pejabat YB EXCO

1. Y.B. Tuan Zaidy bin Abdul Talib
   (Pengerusi Jawatankuasa Tetap Infrastruktur & kemudahan Awam, Permodenan Pertanian Dan Industri Asas Tani)

2. Encik Mohd Adram bin Musa
   (Pegawai Penasihat Dasar)

Seksyen Makro DanPenswastaan, Unit Perancang Ekonomi Negeri (UPEN)

1. Encik Mohd Muktafi bin Sarpan
   (Penolong Pengarah)

2. Puan Wan Nur Aisyah binti Wan Din
   (Penolong Pengarah)

Jawatankuasa Pemantauan Air Selangor

1. Encik Khairy bin Yeob

2. Encik Mansor bin Abd Ghani
3. Encik Mohmed Asari bin Daud
4. Encik Mohamad Sarbani bin Che Noh
5. Encik Mohamad Yazid bin Selamat

Lembaga Urus Air Selangor (LUAS)

1. Tuan Haji Md Khairi bin Selamat
   (Pengarah)

Indah Water Konsortium Sdn. Bhd

1. Encik Zakariah bin Mohd Yassin
   (Senior Manager)

2. Encik Manirajah
   (Trek Manager)

LAMPIRAN II

Bacaan ammonia di Loji Rawatan Air menurut Jabatan Alam Sekitar (JAS)

1. LRA Batu 11 Cheras

TARIKH	BACAAN AMMONIA (mg/L)		
	MIN	MAK	PURATA
28/1/14	4.4	7.9	6.1
29/1/14	3.6	8.3	5.8
30/1/14	3.4	6.7	5.1
31/1/14	3.3	7.2	5.4
1/2/14	1.4	5.8	3.4
2/2/14	1.1	2.6	1.8
10/2/14	2.1	6.0	4.2

2. LRA Bukit Tampoi

TARIKH	BACAAN AMMONIA (mg/L)		
	MIN	MAK	PURATA
29/1/14	3.3	7.4	5.8
30/1/14	3.8	6.7	5.4
31/1/14	4.6	6.8	5.4
1/2/14	2.8	7.3	4.9
2/2/14	3.7	6.3	4.8
3/2/14	2.2	5.1	3.5
4/2/14	2.5	5.0	4.0
5/2/14	4.0	5.7	4.8
6/2/14	3.7	5.1	4.4
7/2/14	3.6	5.3	4.0
8/2/14	2.4	5.3	3.5
9/2/14	2.1	4.1	3.2
10/2/14	3.7	5.0	3.9

LAMPIRAN III – Kajian Teknikal Cosmoball

Evaluation Biofilm Sewage Treatment Plant

K. M. Shahot. I. A. Ekhmaj

***Abstract*—**The research study is carried out to determine the efficiency of the Biofilm sewage treatment plant which is located at the Engineering Complex's. Wastewater analyses have been carried out at the Environmental Engineering laboratory to study the six parameters: Biochemical Oxygen Demand BOD, Chemical Oxygen Demand COD l, and Total Suspended Solids TSS, Ammoniac Nitrogen NH3-N and Phosphorous P which have been selected to determine the wastewater quality. The plant was designed to treat 750 Pe (population equivalent) at hydraulic retention time of 5 hours in the aerobic zone. The results show that Biofilm wastewater treatment plant was able to treat sewage successfully at different flow condition. The discharge has fulfilled the Malaysia Environmental of Standard A water quality. The achieved BOD removal is more than 85%, COD is more than 80%, TSS is more than 80%, NH3-N is more than 70%, and P was more than 70%. The Biofilm system provides a very efficient process for sewage treatment and it is compact in structure thus minimizes the required land area.

***Keywords*—**Sewage, Bio film, Cosmo-Ball, Activated sludge

I. INTRODUCTION

SEWAGE can be defined as wastewater, which is discharged from domestic sources such as homes, restaurant, industries and agricultural plants etc. The wastewater contain substance like human waste, food scraps, oil, soaps and chemicals. Generally the sewage flows through an extensive network of underground pipes to wastewater treatment plant where the polluted water is treated using various methods to remove the pollutants. If the polluted water is fed directly in to the rivers lead water contamination. The statistical account of polluted rivers in Malaysia remained at 14 as in the previous years which are Dondang, Sg. Jurn and Sg. Jejawi in Penang; Sg.Deralik and Sg. Raja Hitam in Perak; Sg. Kelang, Sg. Buloh and Sg. Sepang in Selangor; Sg. Tukang Batu, Sg. Pasir Gudang, Sg. Sedili Kecil, Sg. Kempas, Sg. Pontian Kechil and Sg. Rambahbah in Johor [1].Some of the Malaysia rivers are heavily polluted with mean BOD levels nearly six times the international standard. The higher level of BOD-related water pollution is due to the residential pollution, followed by agriculture and industries. Of the 119 rivers monitored for wastewater pollution, 34 rivers exceeded the standards. The numbers of affected rivers were nine in Johor, seven in Selangor, six in Sarawak, three in Terengganu, two each in Melaka, Pahang, Perak and Sabah and one in Negeri Sembilan.

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The reasons behind the sewage treatment are the scarce in natural water resources and the higher demand of clean water supply. Moreover the higher volume of wastewater back to natural water resources deteriorates quality of water in receiving bodies. These matters have emphasized technological development in water industry to provide innovative yet proven technical solution.

The main goal of any sewage treatment plant is to reduce or remove organic matters, solids, nutrients, disease-causing organisms and other pollutants from wastewater.

Sewage treatment plants go through several steps in a treatment process in order to safely treat large quantities of wastewater. In addition to that each sewage treatment plant must hold a permit listing the allowable levels of BOD_5, suspended solids, and other pollutants. Currently the systems like septic tank, activated sludge, oxidation ponds and aerated lagoon are used to treat the polluted wastewater. These wastewater treatment plants are not very efficient in treating sewage.

The BioFilm wastewater treatment system is more effective than conventional wastewater treatment system.

II. METHODS

A. Experimental Procedure

The sewage analyses are carried out in the Environmental Engineering Laboratory near to the Engineering Complex's sewage treatment plant. Sewage sample are taken from different sampling points and are analyzed immediately. The four samples are taken from grease trap, balancing tank, clarifier tank and discharge end. The parameters analyzed are Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total suspend Solid (TSS), PH value, Ammonia Nitrogen and Total Phosphate. The experiments are repeated several times to obtain average results. The sample analyses are carried by using the standard examination method called Hach Spectrophotometric. The experiments are carried out by taking samples at influent, effluent and intermediate points.

B. Cosmo- Ball Filter Media

The Cosmo-ball media is suitable for both aerobic and anaerobic situations. It is light in weight, floats in water and therefore easy to remove or clean whenever it is required. The Cosmo-ball is made of strong polyethylene plastics which will resist even highly corrosive or hazardous effluent. The innovative design of cosmo-balls makes it less prone clogging as the void spaces provided is in excess of 85%. [2].

BioFilm system offers many advantages which are needed for sustainable wastewater treatment plants, the most important features are:

1. Effective treatment within short retention time, thus save space and also capital costs.

2. It needs less air for aeration (special characteristic of BioFilm processes).
3. Modular in construction (which can be upgraded to fit increased population).
4. Effective for both BOD and nitrogen removal.
5. No objectionable odor release.
6. Quick restarting especially during power failure.
7. Small land area requirement

The most important feature of BioFil system is in terms of 40% land saving and increase buffer distance (50%) to nearby residential premise, as show below.

Fig. 1 Cosmo-Ball Media

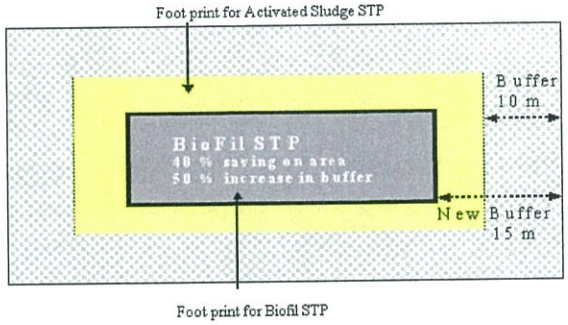

Fig. 2 Biofilm STP & Activated Sludge Foot Print

III. Results and Discussions

The parameters in this study are given in Table(1).

A. Flow

The flow of STP is varied from 120.50 m3/day to 154.25 m3/day shown in Fig(3). The flow of the sewage water is normal during 8.00, 11.00, 13.00 and 16.00 hours day and it reaches a maximum value of 154.25 m3/day in the afternoon. Minimum flows occur during the evening hours when water consumption is lowest.

In most cities were the low flow occur from 04 to 08 am morning but the peak flow occur from 12 to 3 p.m afternoon [3].

TABLE I
THE FREQUENCY OF PARAMETERS AND POSITION OF SAMPLING

No	Parameter	Frequency	Position of sampling
1	*Flow rate*	*4. times per day (duration 5 days).*	*at discharging point*
2	*TSS*		*at inlet & discharging point*
3	*BOD*		*at inlet & discharging point*
4	*COD*		*at inlet & discharging point*
5	*AN*		*at inlet & discharging point*
6	*P*		*at inlet & discharging point*

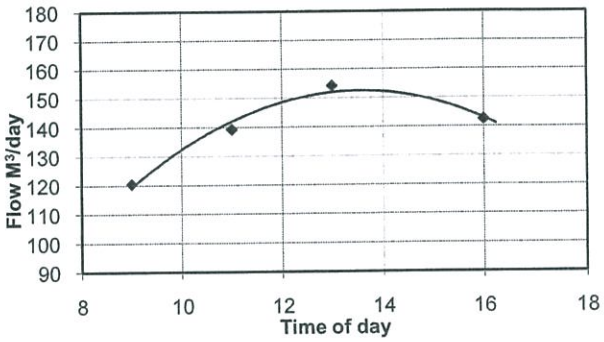

Fig. 3 Flow of sewage treatment plant per time

B. Organic loading rate

The calculated organic load for the STP is from 0.228 kg BOD/m^3 dayto 0.351 kg BOD/m^3. day rating. From Fig (4), it can be seen that the BioFilm sewage treatment plan reduces the BOD levels.

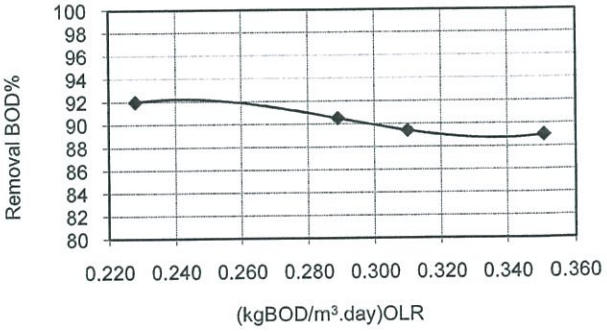

Fig. 4 BOD % removal within organic loading rate

C. BOD Reduction

BOD is the most important parameter in water pollution control. it is used as a measure of organic pollution, as a basis for estimating the oxygen needed for biological processes, and as an indicator of process performance[4].

The maximum and minimum BOD level of the inlet and outlet sewage is 159.5mg/L and 11.0mg/L respectively. The achieved BOD level of treated sewage is equivalent to standard A, which is less than 20mg/L Fig(5). shows the efficiency of the BioFilm sewage treatment plant .

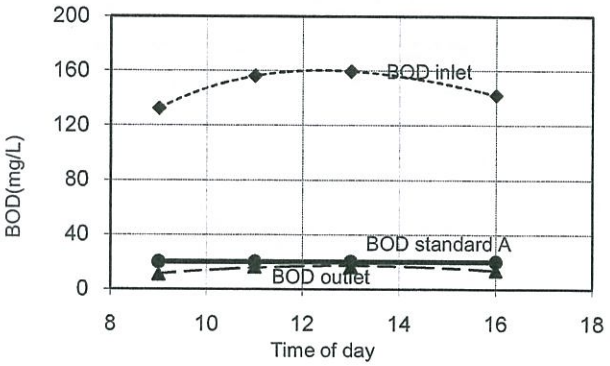

Fig. 5 Reduction of BOD concentration within the system

D. BOD Removal

The maximum and minimum BOD removal rates are 91.69% and 89.42% at 9.00 and 11 hour respectively which shown in Fig (6). The average BOD removal is approximately 90.31%.

E. COD Removal

The maximum and minimum COD removal rates are 87.50% and 85.47% at 13 and 16 hour respectively and shown in Fig (6). The average COD removal is approximated 86.51%.

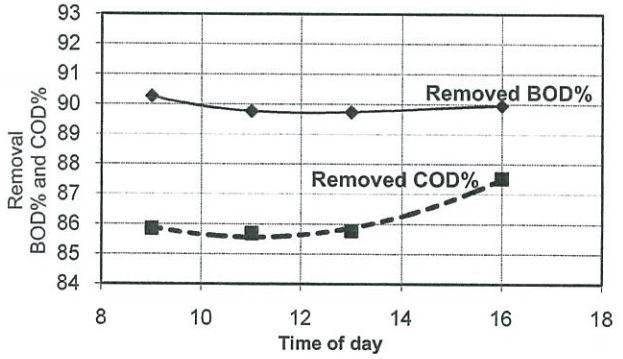

Fig. 6 BOD % and COD% removal per time

F. COD Reduction

The maximum and minimum BOD level of the inlet outlet sewage is 213mg/L and 21,5mg/L respectively and shown in Fig (7). The achieved COD removal is equal to standard A, which is less than 50mg/L Fig(7). This shows that the BioFilm sewage treatment plant is performing well.

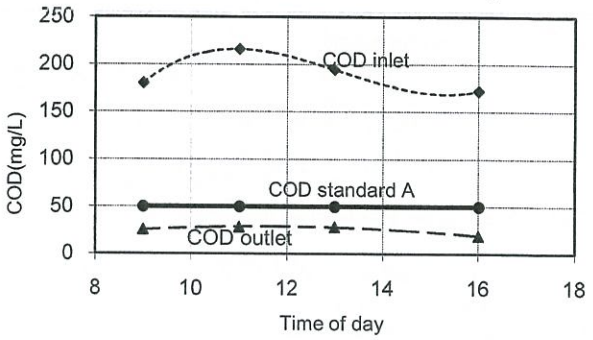

Fig. 7 Reduction of COD concentration within the system time

G. TSS Reduction

The maximum and minimum TSS level of the inlet and outlet sewage is 106.29mg/L and 9mg/L respectively. The achieved TSS removal is equivalent to standard A, which is less than 20mg/L and shown in Fig(8). This shows the efficiency of the BioFilm sewage water treatment plant.

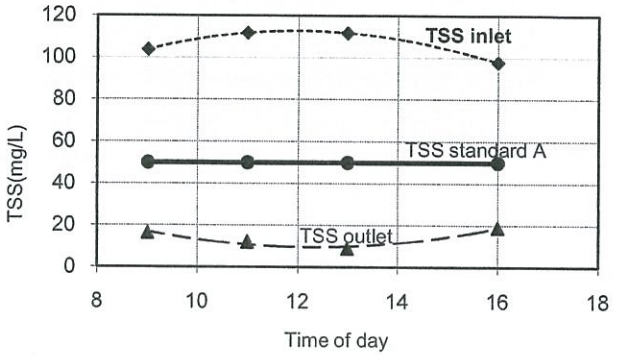

Fig. 8 Reduction of TSS concentration within the system time

H. Reduction of NH_3-N and P

The NH_3-N and P values are presented in Fig (9). The measured NH_3-N and P values are:

A. 120mg/L and 5.50 mg/L from the raw influent.
B. 1.75mg/L and 0.41 mg/L from the final discharge.

The above gradual reduction of NH_3-N and P values show that the BioFilm sewage treatment plant works well at various loading and operation conditions..

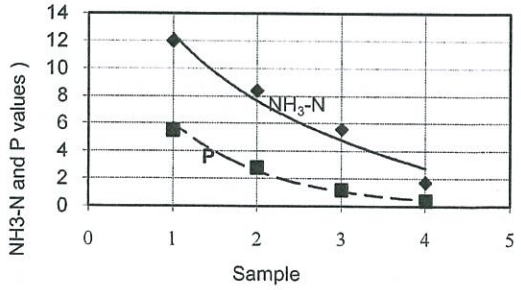

Fig. 9 Reduction of ammonia and phosphorus concentration within the system

IV. Conclusions

From the estimated results, it can be concluded that biofilm system of the engineering complex sewage treatment plant is working well and the effectively removing the organic components from the sewage.

The following conclusions are drawn from the experimental results.

1- Biofilm system has shown to be very effective in removing BOD 90%, COD 86% and TSS 86% during flow conditions.
2- The ammonia nitrogen and phosphorous removal achieved in the Biofilm system are 85% and 90% respectively during flow condition.

References

[1] New Strait Times http://www.recyclingpoint.com.sg/Articles/1992june25-Squattersalsotoblameforriverpollution.htm
[2] Pakar Management, *BioFilm product catalogue.* Technology Sdu Bhd,2005.
[3] S. Qasim,(1999) *Wastewater: Treatment PlantsTechnomic.* Publishing Company Edition, 2th Edition,
[4] J. Glynn Henry& Gary. *Environmental Science and Engineering* Toronto, 2000.

Journal of Applied Sciences 10 (24): 3384-3387, 2010
ISSN 1812-5654

This article was presented in International Conference on Process Engineering and Advanced Materials 24th Symposium of Malaysian Chemical Engineers (15th-17th June, 2010)

Numerical Studies of Fluid Flow Across a Cosmo Ball by Using CFD

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Abstract: Cosmo ball is a media used in wastewater treatment to increase the surface area of contact and provide longer contact time for biological activities. It is usually placed as a media or as packing in the aeration tank, BioFil tank or even in the activated sludge tank. It induces the growth of bacteria on its surface, which will serve as a contact area for the wastewater and the microbial. The objective of this simulation is to analyze the flow pattern around the Cosmo ball which is been packed in the wastewater treatment tank. By conducting this analysis, the overall insights on the interaction of the fluid flow with the Cosmo ball surface can be visualize. The velocity of the fluid flow across the ball is at a speed of 2 cm sec^{-1}. The velocity was obtained from the conventional wastewater treatment plant. During the simulation process, the model will undergo each section of program in ANSYS™ Computational Fluid Dynamics (CFD) such as Design Modeler, Meshing, Pre-Processing, Solver and Post-Processing. The flow distribution across the Cosmo ball was analyzed by varying the angle of attack of the flow. The rationale for this simulation arrangement is that the ball could take any orientation in the bulk media and the fluid flow across it would be at random angle. The result shows that the flow around the Cosmo ball was dispersing sideways thus inducing mixing in the wastewater system. Retention of flow has been observed to occur in the Cosmo ball. The retention of flow provides better microbial interaction with the wastewater.

Key words: Cosmo ball, computational fluid dynamics, wastewater, BioFil, flow, velocity

INTRODUCTION

Cosmo ball is made from plastic and the actual model is depicted as in Fig. 1. It has a proprietary design developed by UPM Waste Technology Centre (http://www.pakar.com.my/). The Cosmo ball mainly has its application as a filter media in an effluent treatment system. A very large surface area could be obtained for microbial attachment as the Cosmo ball has a design such that a surface for fluid interaction with the microbial is greatest. This will greatly improve the degradation of organic matter in wastewater trough the microbial activities.

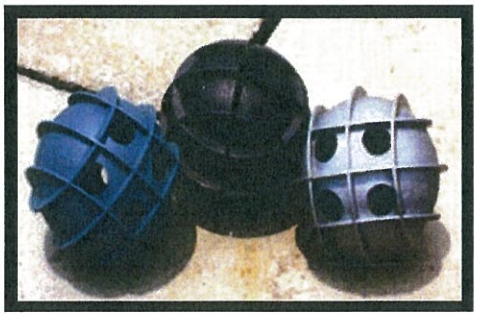

Fig. 1: Actual Cosmo ball model (http://www.pakar.com.my/)

To be specific, the application of the Cosmo ball is in regards to the trickling process in wastewater treatment. The ball acting as the packing media will be located inside the tank where the wastewater flows across it. This will induce the microbial film growth and cling on the surface of the media (Lee and Shun, 1999). The microbial will oxidize the organic matter in the wastewater. By having a large population of microbial in the wastewater will directly translating to a better efficiency of the treatment plant (Ahmed *et al*., 2007). The specification of the Cosmo ball is shown as in Table 1.

According to experimental analysis, the bacterial developed on the Cosmo ball surfaces will be in excess of 5,000 to 10,000 mg L^{-1} (http://www.pakar.com.my/). This high value of bacteria growth on each of the Cosmo ball will yield a good efficiency in wastewater treatment and it is suitable in the anaerobic and aerobic conditions. The simulation of flow across the Cosmo ball will give full insights on the flow pattern around the ball.

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Table 1: Specification of Cosmo ball (http://www.pakar.com.my/)

Parameters	Values
Material	Polyethylene (PE)
Shape	Spherical
Specific gravity	0.9
Void fraction	85%
Outer diameter	85 mm
Inner diameter	75 mm
Wall thickness	>0.5 mm
Bulk density	75 kg m^{-3}
Specific surface area	> 160 m^2 m^{-2}
Number of Media/m^3	>2000
BOD loading factor	up to 5 kg/m^3.d
Hydraulic loading rate	0.06 $m^3/m^2/h$
Number required/PE	Varies with loading

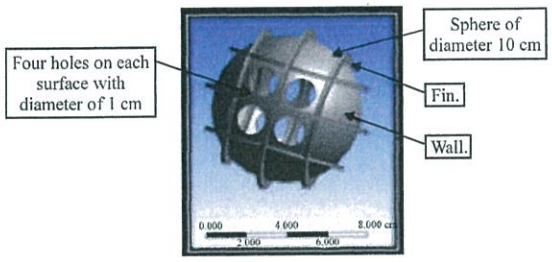


Fig. 2: Model of a Cosmo ball

MATERIALS AND METHODS

In modeling, the Cosmo ball was created with Design Modeler (DM) by ANSYS™. The Cosmo ball model was developed as shown in the Fig. 2.

The fins around the ball serve to induce mixing in the bulk Cosmo balls wastewater system. The fluid flow is expected to divert outwards to the neighboring Cosmo ball. The flow strategy was implemented in 2 angles of attack. The direction of attack of the fluid on the ball was illustrated as Fig. 3. The 2 angles of fluid attack of 0° and 90° were analyzed. The dash line in the figure illustrates the symmetry axis of the ball.

The model of the Cosmo ball is then being brought into ANSYS™ Meshing to convert it to finite element model in order for it to be solved numerically. The physics and boundary condition is then applies. The wastewater inlet flow velocity of 2 cm sec^{-1} and its direction is defined. The surrounding is defined as an opening for the water to flow freely sideways. It is to be noted that this simulation will not cover all the possible direction of wastewater flow across the Cosmo ball. Instead, two extremes flow direction will only be considered which is depicted in Fig. 3. With the two flow direction extremes, the flow pattern could be forecasted for any possible angle as the ball is symmetry vertically and horizontally.

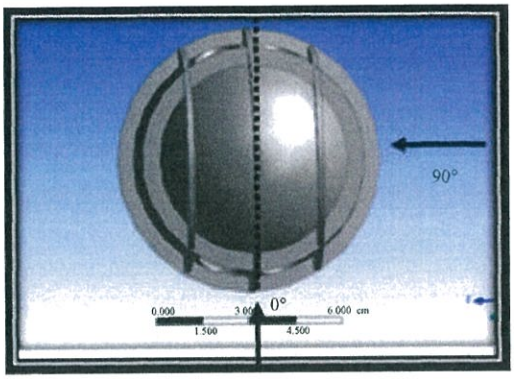


Fig. 3: Angle of fluid attack

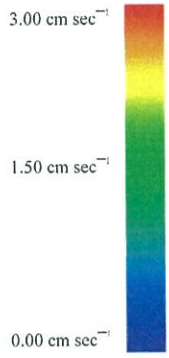


Fig. 4: Fluid flow velocity component scale

RESULTS AND DISCUSSION

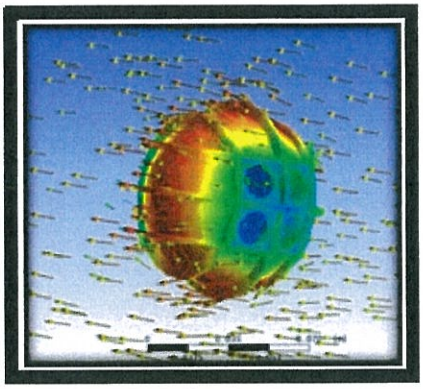
Fluid flow system from a higher velocity to a lower velocity is shown in the scale as in Fig. 4 where it is represented by red color contour to blue color contour.

An overall exterior and interior fluid flow across the Cosmo ball was depicted in Fig. 5a and b, respectively. It is seen that the velocity distributed uniform namely intermediate flow region across the Cosmo ball whereas the velocity is higher at the edge namely turbulence flow region of the fluid flow direction. Figure 5b shows the interior observation where the fluid flows slowly in the hollow region causing a lag of flow for the internal zone of the ball. The fins across the Cosmo ball caused dispersion to the fluids streamline. The overall contour plot of uniform vector streamlines at 0° flow angle was depicted in Fig. 5c.

The angle of flow at 90° was shown in Fig. 6a and b. It is observed that the water is still able to enter the hollow region. There is an extremely chaotic region observed inside the Cosmo ball. The blue regions indicate that the flow was retarded due to collision of the fluid to

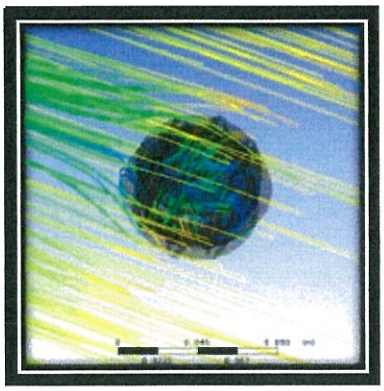
(a)

(b)

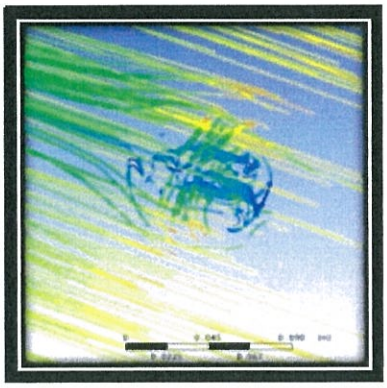


(c)

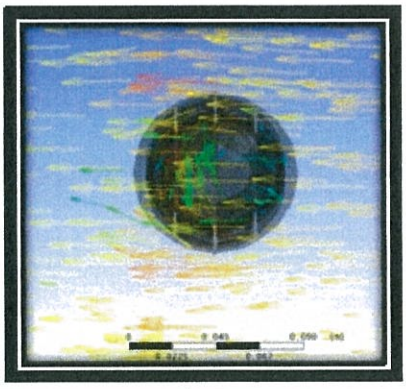
Fig. 5: Fluid flow across at 0° (a) exterior, (b) interior and (c) vector direction at fixed Cosmo ball position (side view) 0°



(a)



(b)



(c)

Fig. 6: Fluid flow across at 90° (a) exterior (iso-view), (b) interior (iso-view) and (c) vector direction (top view) at fixed Cosmo ball position 0°

the wall. In order to show the fluid direction across the Cosmo ball, vector plot was shown in Fig. 6c. It was observed that most of the wastewater traps in the hollow region of the Cosmo ball. This phenomena retards the wastewater flow, thus prolong the interaction time between the bacteria and the wastewater.

CONCLUSION

The objective of this simulation is to analyze the flow pattern of wastewater across the Cosmo ball in the wastewater tank. It is found that the lag of flow in the individual Cosmo ball indicates that the hollow region in the ball can induce higher retention time for wastewater treatment. This will greatly improve the efficiency of the wastewater treatment plant as well as to reduce the area needed for the treatment due to sufficient time for the microbial in the wastewater to obtain oxygen for oxidation process.

ACKNOWLEDGMENTS

First and foremost, I would like to express my deepest gratitude, appreciation and support to the staffs of Pakar Management Technology their valuable information, advice and comments trough the achievement of this project.

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