

## **MyBOT-X: THE FIRST MALAYSIA FIRE FIGHTING ROBOT**

### **INTRODUCTION**

Firefighting is one of the highly hazardous works in the world. The firefighters need to extinguish fire in the hazardous environment as well as need to carry the equipment, take care of his own safety, saving fire victim and the properties. According to the statistic by International Association of Fire Fighters (IAFF), the death rate of US firefighters per year, per 100,000 structure fires is around 1.9 firefighters (IAFF, 2000). However, the number is increasing throughout the year to 3.0 per 100,000 structure fires (Kyle, 2007). There are many causes for the death of the firefighters during line of duty such as burns, structure falling, explosion, crushing injuries and related trauma (Rosmuller and Ale, 2008). For each year, there are many firefighters in the world lost their live in the line of duty. During the line of duty, firefighters are facing different kind of hazardous and life threatening condition such as building collapse, corrosive gas, explosion and radioactive. The firefighters in United Kingdom, Belgium and the Netherlands are not allows their fire fighters to enter the burning building. The move is to avoid their firefighter to be trapped and lost in life. The current equipment that used by firefighters such as helmet, gloves and flat head axle are not sufficient to protect them from danger. The firefighting techniques and technology need to be improved in order to reduce the fatalities among firefighters. Currently, there are many research and development around the world to develop the firefighting robot to assist and replace the firefighter in the line of duty. Different kind of firefighting robots have been used by Fire Services Department around the world such as Hong Kong and Singapore. The machine is able to help the firefighter to extinguish the fire, carry the necessary equipment, victim searching, surveillance without the direct involvement of firefighter in hazardous environment.

The advancement of firefighting technology has been improved the firefighter equipment. The firefighting is become more effective and the fatalities among the firefighter able to be reduced as well as the risk will be minimized. One of the technology advancement to battle fire is the application of robot. The robot is one of the method to reduce the hazard risk as well as fatalities risk of firefighter. Different type of robots have been developed and used in the world. The Austrian made LUF60 (NRT, 2013), is a diesel powered machine that equipped with air blower and a water beam fog. The high speed air will mix with the water and becoming the fog to extinguish the fire. The machine is able to blow the water up to 80 meter. FIREROB (Americancrane, 2012) is another robot that equipped with heat shield. It is equipped with high pressure water mist extinguishers to control the fire. The robot also can be installed with thermal imaging camera and sensors for feedback purpose. The Croation manufacturer, namely, DOK-ING (DOK-ING Company, 2010) has developed a multifunctional 9 ton firefighting robot. This is the biggest long range (1500m) remote control technology GPS-INS (Global Position System – Inertial Navigation System. JMX-LT50 (Chinawe, 2013) is a remote controlled firefighting robot that developed by China manufacturer. The robot is equipped with water cannon that able to spray the water in different angle and distance. JMX-LT50 is using the tire for mobility purpose. The US based firefighting robot, Thermite (Howeandhowe, 2013) is developed to fight against urban fire, forest fire and industry fires. The Thermite can be control with a distance around 400m away. Besides, the robot is able to control with a multi-directional monitor to ensure the safety of the user. The Thermite is designed for rough terrain as well as building

environment. The Fukushima Daiichi nuclear plant which damaged by the massive tsunami has been inspected by a robot called iRobot PackBots (Hornyak, 2011). The robot has been deployed into the nuclear plant to record the radiation levels.

Singapore Civil Defence Force (SCDF) has bought 2 unit of LUF60R from Austria in 2014. The UFM is a remote-controlled robot which helps the Singapore Civil Defence Force (SCDF) put out fires, especially those occurring in large warehouses, factories, refineries and underground facilities. The UFM is able to navigate over difficult terrains and clear bulky obstacles in its path. The UFM has been successfully deployed to fight warehouse and factory fires that had occurred in Tuas, Sungei Kadut and Fan Yoong Road. With the UFM, more lives and property can be saved from devastating fires.



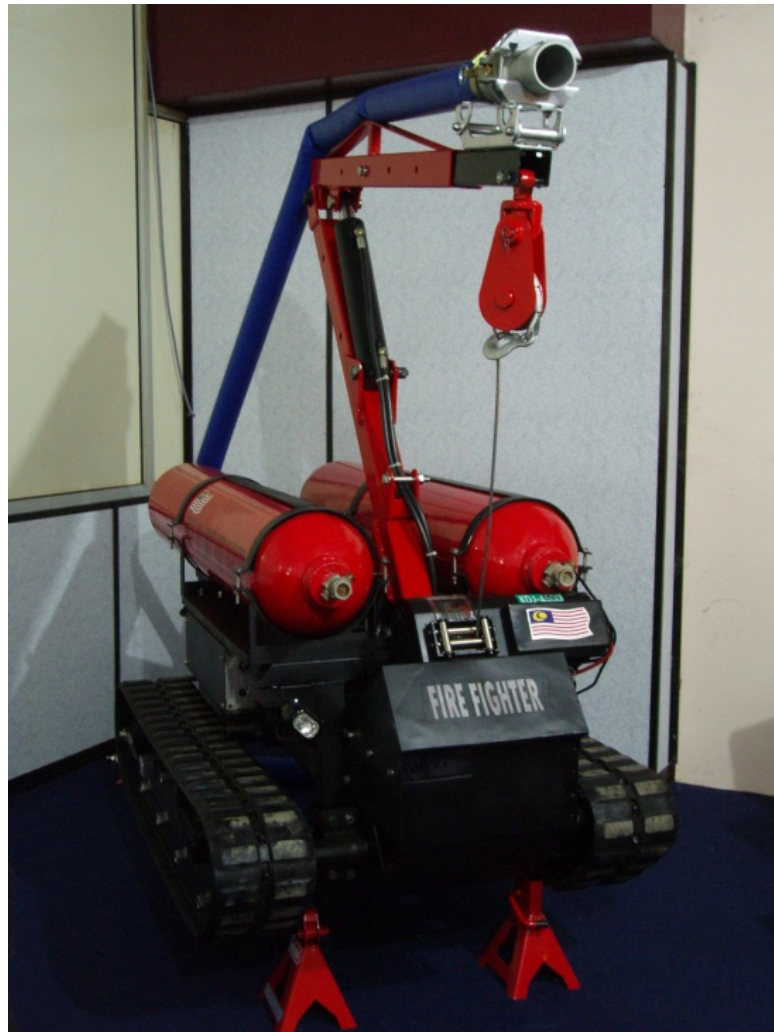
**Figure 1** Unmanned Firefighting Machine of SCDF

MyBOT-X is first Malaysian designed, developed and manufactured advanced robotic system, MyBOT-X is a remotely controlled machine consists of a mobile and rigid chassis. The machine is wirelessly controlled up to 500m. The nozzle of the machine can be directed at different angle and can be elevated in order to control fire at different height. One of the importances of the development of the robot is to reduce the risks faced by firefighters in performing their duties. MyBOT-X system is a modular-based mobile robot that is light weight, equipped with long-range control ability for firefighting and victim searching purpose. The robot can be used for different purposes such as surveillance, object clearance, inspection, compound guiding by changing the top part of the robot.

The MyBOT is capable of fire fighting, searching and inspection purpose in a small and hazardoud environment. In addition, the MyBOT is using green energy, which is electric, to power the machine. Besides, MyBOT can be equipped with petrol or diesel engine upon request, The MyBOT is equipped with state of the art sensor and imaging system to locate fire victim. The first generation of MyBOT was developed in the year 2004.

## **1<sup>ST</sup> GENERATION OF FIRE FIGHTING ROBOT (MyBOT 1000)**

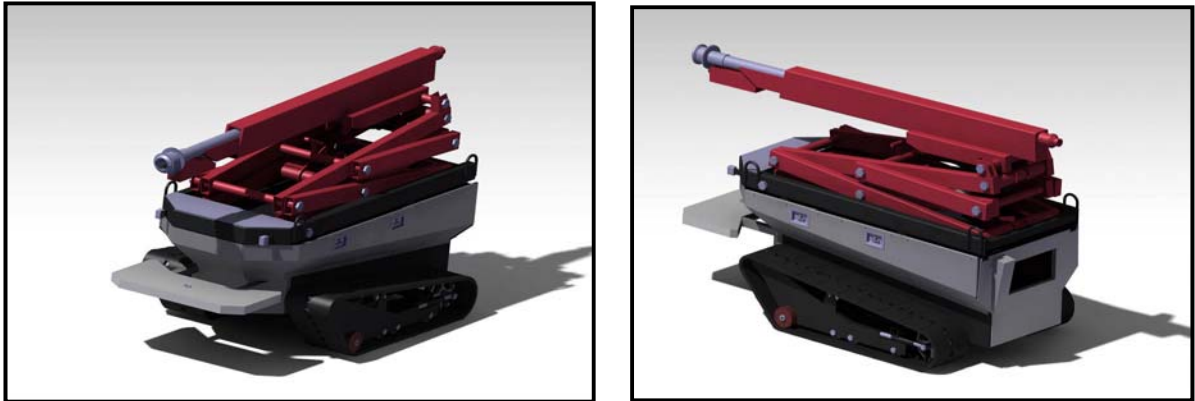
The first generation of MyBOT 1000 (Figure 2) was developed in year 2004. It si equipped with elevated arm, a motorized crane hook system and two compressed water tanks.



**Figure 2** The 1st generation MyBOT 1000

## **2<sup>nd</sup> GENERATION FIRE FIGHTING ROBOT (MyBOT 2000)**

MyBOT 2000 is the second generation of robot that has stronger structure than MyBOT 1000. It was developed in year 2006. The MyBOT 2000 is using the same platform like MyBOT 1000. Figure 3 shows different view of MyBOT 2000.



**Figure 3** Different view of MyBOT 2000

### **The Specification of MyBOT 2000**

Figure 3 and Figure 4 shows the side view and isometric view of MyBOT 2000. The engineering specification of final design MyBOT 2000 is as given in Table 1. Figure 5 shows the fully elevated water hose. The MyBOT 2000 has been tested and verified by Fire and Rescue Department Malaysia (Appendix 1).



**Figure 4** Side View of Final Prototype of MyBOT 2000



**Figure 5** Isometric View of Final Prototype of MyBOT 2000

**Table 1:** General specifications of the MyBOT 2000

Hardware	Specification
Track System	Heavy duty rubber track belt
Electrical	22V
Engine	Electric DC Motor
Engine Power	750 W
Engine Current	46 A
Engine Speed	1900 rpm or 198.97 rad/s
Torque	3.77 Nm
Transmission	Automatic
Curb weight	900 kg
Maximum Speed	5 km/h



**Figure 6** MyBOT 2000 with full extension of elevated fire hose

To watch MyBOT 2000 in action, please follows the following YouTube links:

Link 1: [http://youtu.be/mTg0\\_13eDYc](http://youtu.be/mTg0_13eDYc)

Link 2: <http://youtu.be/nZMpRyyPjwM>

Link 3: <http://youtu.be/QptsFo1LL6s>

Link 4: <http://youtu.be/Y1h5G6Cf4Zo>

Link 5: [http://youtu.be/8s\\_m\\_YvOIB0](http://youtu.be/8s_m_YvOIB0)

Link 6: <https://www.youtube.com/watch?v=fJvhXfkXVY&feature=autoshare>



### **3<sup>th</sup> GENERATION MODULAR-BASED FIRE FIGHTING ROBOT (MyBOT 3000)**

The 3<sup>th</sup> generation of MyBOT-X (Figure 7) is an up scaling new generation of Fire Fighting Robot. The new design of the MyBOT is equipped with new self-developed track system, lighter structure, controllable multi-directional water cannon, wireless CCTV, long range control capability as well as it is a modular designed robot. The common based of MyBOT was based on modular design approach in order the MyBOT-X can be used for different purposed or customizable. MyBOT3000 can be transformed and used for surveillance and guarding, military defense, inspection, bomb removing, police tactical, hazardous material removal, etc.

The new MyBOT 3000 is powered by 12 V DC motor electric. The dimension of the MyBOT 3000 is 1.5 m (W) X 2 m (L) X 1.5 m (H). Figure 6 shows the MyBOT 3000. The MyBOT 3000 has been showcased in Engineering Invention and Innovation Exhibition 2013 (EINIX 2013) at One Utama that organized by Institution of Engineers, Malaysia (IEM).

MyBOT3000 also has been reported in newspaper:

1) Sin Chew Daily (Appendix 2)

2) New Straits Time (Appendix 3)

link: <http://www.nst.com.my/life-times/tech/burning-passion-for-robots-1.553099>

3) The Star Metro BIZ (Appendix 4)

Link: <https://www.thestar.com.my/business/sme/2014/05/21/rise-of-the-robots-company-aims-to-commercialise-remotely-operated-vehicles/>

To watch MyBOT 3000 in YouTube, please follows this link:

Link 6: <http://youtu.be/r6uF8upS0eU>.

Link 7: <http://youtu.be/6ejCLB-52b4>



**Figure 7** MyBOT3000

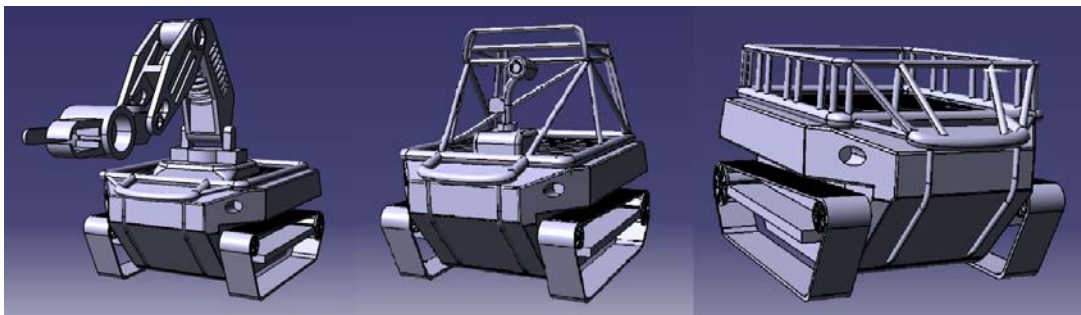


The specification of MyBOT 3000 as shown in Table 2

**Table 2:** General specifications of the MyBOT 3000

Hardware	Specification
Track System	Heavy duty roller chain with rubber track
Electrical	24 VDC
Engine	Electric DC Motor with gear box
Horse Power	3.3 hp
Transmission	Automatic
Curb weight	700 kg
Maximum Speed	10 km/h
Water Cannon (optional)	Elkhard Brass Vulcan (optional) – 1250 GP (4732 LPM)
Wireless Control	RF with FCC compliance

MyBOT 3000 is a modular design and it can be transformed into different functions with the same platform. Figure 8 shows MyBOT3000 with 3 different future functionalities.



**Figure 8** The modular design on MyBOT 3000

Both MyBOT 2000 and MyBOT 3000 were tested at Fire & Rescue Research Centre (PUSPEK), Bandar Enstek in year 2014 (Appendix 5).

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## Appendix 1



JABATAN BOMBA DAN PENYELAMAT MALAYSIA  
BALAI BOMBA DAN PENYELAMAT AYER KEROH,  
JALAN AYER KEROH LAMA,  
BUKIT BERUANG,  
75450 MELAKA.

TEL : 06-2319134/35  
EXT : 211  
FAX : 06-2322406

Kepada pihak berkenaan,

Tuan,

### REKABENTUK DAN PEMBANGUNAN MESIN MEMADAM KEBAKARAN

Adalah dimaklumkan Pihak Bomba dan Penyelamat Malaysia telah bekerjasama dan menguji Mesin Memadam Kebakaran yang dibangunkan

2. Berdasarkan ujikaji yang telah dijalankan, pihak kami mendapati mesin tersebut adalah praktikal untuk digunakan dalam memadam kebakaran dan membantu mengelak bencana tidak diingini kepada anggota bomba. Mesin tersebut juga telah mencapai tahap standard diperlukan dalam proses memadam kebakaran.

3. Oleh yang demikian, kami amat mengalu-alukan penambahbaikan, penyelidikan berterusan seterusnya pengkomersilan mesin tersebut untuk diaplikasi sepenuhnya di dalam proses pemadaman kebakaran di Malaysia. Kami juga menyokong permohonan geran penyelidikan dan pengkomersilan yang dimohon oleh penyelidik.

Sekian, Terima Kasih.

**"BERKHIDMAT UNTUK NEGARA"**

**"SATU MALAYSIA" RAKYAT DIDAHULUKAN. PENCAPAIAN DIUTAMAKAN"**

**"SATU MALAYSIA, MELAKA MAJU 2010"**

Saya yang menurut perintah,

( **SABRI BIN SENIN** )

Pegawai Latihan

Jabatan Bomba dan Penyelamat Malaysia  
Balai Bomba Ayer Keroh,  
Negeri Melaka.

## APPENDIX 2



Sin Chew Cyberworld  
February 11

又一國產機器人登場: MyBot 3000救火機器人。敬請留意明大2月12日《活力副刊: 新媒體》。

Sek Teng, Liang Lai Sin, Shyan Eng and 9 others like this.

The press coverage in SinChew Daily (12 February 2014)

## APPENDIX 3

4/15/2014 Burning passion for robots - Tech - New Straits Times

Thursday, April 10, 2014, 11:47 PM

**NEW STRAITS TIMES**  
Our deepest condolences to the families of passengers and crew of flight MH370

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07 April 2014 | last updated at 09:10 PM

**Burning passion for robots**

By Nicholas King

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**The BIGGEST**  
Autonomous College  
in Malaysia

**Three men transform their labour of love for robotics into building a public service firefighter, writes Nicholas King**

MINI dream all the time and sometimes they dream of building robots. Three men decided to make use of their automation know-how for the good of the nation, creating a robot for the country's firefighting brigade to save lives and costs it's the first of its kind in the nation.

"We decided to contribute to the fire-fighting sector as the cost to hire and train another fireman is high," says Dr Tan Chee Fai, "We thought to ourselves, why not do something for society on top of what we already love to do."

**HOW THEY GOT STARTED**

In 2005, Tan and his mentor Danny Lim, the managing director of Intelligo Technology, were at an exhibition displaying their sewer inspection automation, the SewerBot, when they met Mark Liew who shared their interest in robotics. The result was their first collaborative effort — the creation of firefighting robot MyBOT2000 — a follow-up to Liew's earlier model MyBOT1000, which has since been dismantled.

"He came up to us and we started talking," recalled Tan, who is a council member of the Institution of Engineers Malaysia and a senior lecturer of Design and Innovation at Malaysia Technical University, Malacca.

"Liew had just built the MyBOT1000 and we had an interest in building a firefighting robot. That common interest led us to this friendship partnership."

"Here, the majority of robotics is invested in the education sector. We're hoping to bring it forth to application which is the industry itself," says Lim who is also a part-time speaker on engineering and robotics at universities.

http://www.nst.com.my/fil-times/tech/burning-passion-for-robots-1.523009

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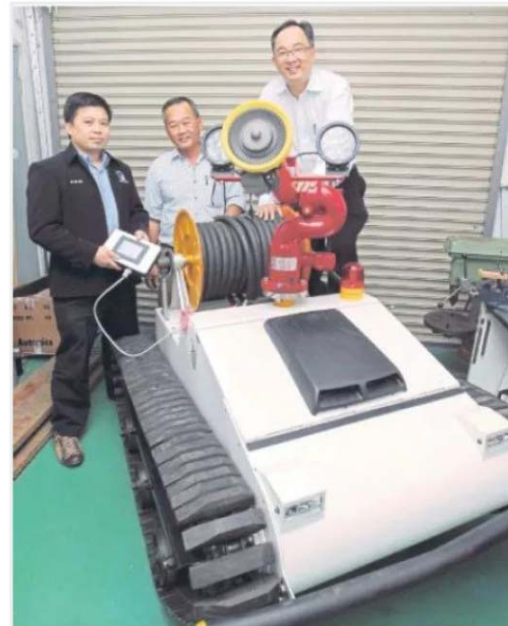
**MY FAMILY SITES**

Harian Metro	Sin Chew
Business Times	MyGadgetPlanet
Trend@	Harun
Edo	Properties

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New Economic Model	NST Reviews
NEOS	Friends of Tropic Times
Property News	NETLAB Archive



Big boys with their toy. (Left to right) Tan, Liew and Lim with their firefighting MyBOT3000, attached with water cannon.

## The press coverage in New Straits Time Press (7 April 2014)



18 **BUSINESS** WEDNESDAY, MAY 20, 2014

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## APPENDIX 5

### Demonstration at Fire & Rescue Research Centre (PUSPEK) , Bandar Enstek, 2014

