Smart Water Fund

Milestone 6 / Final Report

Water Recycling Module

Prepared by: Eugene Antczak & Garry Watson - MFB

With the support of the Smart Water Fund

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City West Water
Melbourne Water
South East Water
Yarra Valley Water
Department of Sustainability and Environment

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Executive Summary

This report summarises the project to manufacture a Water Recycling Module **(WRM)** funded by the Smart Water Fund **(SWF)** for Metropolitan Fire Brigade **(MFB)** operational use in both fire fighter training and maintenance of fire fighting appliances at the Thornbury Workshops. The project began in 2008 with the granting of funds under a Round 5 Funding Agreement between the SWF and the MFB. The Water Recycling Module was based on a prototype design which had initially been developed by Garry Watson of the MFB in conjunction with the MFB fleet Department.

One of the major aims of the project was to reduce the water usage of non – metered water used for fir fighting related activities by utilizing recycled water from the WRM. This project also developed a process which monitors the implementation of the WRM into MFB operational and training activities.

The project would be considered successful if the WRM clearly demonstrates a significant reduction in the consumption of non – metered water and an increase in training activities. The information presented in this report will show that the project has been a resounding success on both counts.

Competitive quotations were called from a list of manufacturers and the SWF funded WRM was completed in early 2010. In addition another three WRMs were funded by the MFB and manufactured on a competitive quotation basis for the Northern, Southern and Western Zones. This provided a significant multiplier effect in water savings and increase in fire fighter training.

There was significant input from MFB operational personnel in collating information on water usage and training under the direction of Garry Watson and these details are presented in this report.

Apart from the financial benefits of using the WRMs there have also been environmental benefits in reducing the amount of water discharged onto pavements and stormwater drains. It has also provided an innovative focus on water saving in fire fighter training and significantly reduced water contamination possibilities with foam use in training.

Significant results have been achieved in the last three years in the reduction of hydrant water usage. This has been impacted by the successful development of the SWF funded WRM for skills maintenance, pump testing and training and the commencement of rainwater capture and reuse systems. This is exemplified by the rainwater capture system installed at the Thornbury Workshops which is used in conjunction with the WRM funded by the SWF. The manufacture of an additional three WRMs funded by the MFB has provided a significant input to the MFB exceeding its water savings targets.

The major achievements have included the progressive implementation of 4 WRMs at three zones and the Thornbury Workshops which has resulted in a 25 ML water savings from WRM use in 2010 while the WRMs were commissioned on a staged basis. The projected water savings for 2011 and each proceeding year is 48 ML or 12 ML per annum per WRM. The projected dollar savings is $48,000 in water cost and $12,000 in fuel cost savings. As each WRM cost around $112,000 this means that each WRM is cost neutral about every twenty two years.

Background

The MFB is a major consumer/user of water for the community benefit in fighting fires. The MFB has a stated policy of reducing water consumption throughout the organisation and has achieved significant success in achieving reductions in water consumption in excess of targets. The use of the WRMs have contributed to this success and will do so on a continuing basis.

The progression of the WRMs into MFB operations has been largely successful because of the feedback from field testing by operational personnel, design improvements during the course of the manufacture of the four WRMs in a sequential program over two years. It has been important for the MFB that this benefit is also shared around the three zones which have a WRM. One of the major challenges is to ensure that the benefits are monitored on an ongoing basis and that consideration be given to incorporating some form of permanent WRM in the design or refurbishment of fire stations. Further research is needed for this but there are possibilities of incorporating smaller fixed WRMs into fire stations based on design elements of the transportable WRM funded by the SWF and now in operation in three zones.

The MFB has estimated that 67 ML of drinking water per year is used for skills training exercises for its 1600 fire fighters at the 47 fire stations. Approximately 700 litres of water is used during 10 minutes of training. Using the WRM provides an opportunity to save approximately 90% of non – metered water currently used for skills training.

Furthermore it is estimated that two billion litres of water is consumed each year through un – metered testing of fire services in the three Melbourne water regions. The use of WRMs will impact on the various MFB sites in the areas of skills training, vehicle maintenance, equipment commissioning, pump testing and calibration.

Each WRM can hold approximately 10,000 litres of water that can be reused in a closed loop for fire fighting exercises and pump testing. The WRM is moveable by truck allowing it to be used at all MFB sites.

Introduction

The intentions and purpose of this project has been twofold. Firstly to reduce the amount of water used in training drills and appliance pump testing and secondly to ensure that training issues that involve the use of water for pump drills enable fire fighters maintain standards to a professional level.

The scope of the project has involved the design and manufacture of a WRM funded by the SWF and the manufacture of three additional WRMs funded by the MFB. Including the within the MFB. This has more than satisfied the key deliverables of implementing WRMs within MFB operations and concurrently establishing operational platforms for reducing water consumption within these operations and also allowing for more regular training exercises without the previous penalty of using non – metered water.

Objectives/Goals

Milestone 6: Final Reporting and Project Debriefing

Purpose: To provide a final report on the entire project

Objectives:

- To provide an evaluation of the project
- To determine the cost benefits
- To confirm the implementation process
- To disseminate the project outcomes

Key Deliverables:

- Final formal report
- Acceptance and implementation of new training procedures
- Inclusion of project outcomes in the Environmental Management System
- Dissemination of information with other fire brigades and local community authorities

Key performance Indicators:

- Formal report completed and signed off
- Training procedures are signed off
- Program of information sharing established
- Case study completed

Milestone 6		
Source	**Amount (GST exclusive)**	
	$	**In kind**
Smart Water Fund	20,000	
MFESB	20,000	
Other		

Literature Review

N/A

Key Steps / Milestones

- **Milestone Description**

  The key milestones for the case study relating to the performance and effectiveness of the WRM were as follows;

  - Establishment of a roster for the fire stations to use the WRM
  - Establishing a methodology for providing and analysing feedback from the operational personnel
  - Collating the performance data relating to water savings from actual operational activities
  - Establishing a basis for calculating the monetary benefits as a result of using all the WRMs at the zones and the Thornbury Workshops

- **Methodology**

  The methodology for the case study included establishing a program of testing of the WRM under normal operational activities and logging the performance. The outcomes of this procedure are given in Appendix 2

  An example of the immediate water saving benefits revolved around 60 recruit fire fighters completing 10 pump drills within a period of 6 – 9 months. Each recruit would use 70,000 litres of water before gaining competency on the MK 5 pumpers. This equates to a saving of 42 ML of water just for this one exercise.

- **Resources**

  Numerous resources were used in the development and implementation of the SWF funded WRM and the additional three MFB funded WRMs. Garry Watson managed the input by MFB fire fighting personnel in providing data on the WRM operation and performance on a rotation basis around the various fire stations. Paul Emsden provided extensive support for Garry Watson in this role.

  The MFB Facilities Department provided the link with SWF in providing the regular reports and project status during the course of the design, manufacture, commissioning and operational aspects of the WRM. The Facilities Department also provided the project management resources in calling quotes, recommending the manufacturing contractor, inspecting progressive stages in the manufacture of the WRM and ensuring that the appropriate MFB personnel were present during tests and final acceptance inspections.

  Eugene Antczak, Project Manager was responsible for ensuring that the project runs to an agreed timetable and achieved its stated aims.

  Water Working Group (WWG) This group comprised eight MFB personnel from Facilities and Operations and meets on a monthly basis.

  Technical consultants Mr Garry Watsonand Mr Paul Emsden provided technical input to the experimental program, analysis and validation of results achieved and ensured recommended modifications were incorporated in the WRM design.

  Smart Water Fund representatives reviewed milestone deliverables and regular Status and Project Plan reports during the course of the project in conjunction with the Project Director / Project Manager and recommended acceptance or otherwise to the Smart water Fund.

- **Timing**

  Timing for this project exceeded the original time plan due mainly to the number of design changes from the original prototype. This provided the benefit of a WRM which is a major enhancement on the original prototype. A significant input to this outcome was the feedback provided by the fire fighting personnel at the various stations where the prototype was tested over a carefully planned period of time.

- **Financial Summary**

  The grant from the SWF was $170,000

  The SWF funded Water Recycling Unit cost $111,727.00

  Other costs included project management, fleet management, fittings, testing and commissioning of the fitted our WRM

  The three additional WRMs funded by MFB cost $330,000 excluding fitout and project management /Fleet input costs

  Say a total of $442,000 with an annual minimum water and fuel cost saving of $61,000 results in a payback of each WRM being cost neutral every two years or if the SWF funded WRM only is taken into consideration then a payback of 2.78 years results based on the total funded amount of $170,000 which is an excellent result.

- **Key Performance Indicators**

  The key performance indicators in the assessment of the WRM performance have been as follows:

  - Amount of water saved over a period of time
  - Frequency of usage
  - Number of fire fighting recruits using the WRM

Findings/Results/Outcomes

The major outcome of the WRM concept and manufacture is that it has been a resounding success. The projections for 2011 are as follows:

Water savings

Southern Zone	120 hours of operation per annum
Western Zone	120 hours of operation per annum
Northern Zone	120 hours of operation per annum
Thornbury Workshops	120 hours of operation per annum

Total Hours of Operation: 480 per annum

Each hour uses 100,000 litres of recycled water

Therefore total recycled water is 480,000,000 litres

Water cost: $1 = 1,000 litres therefore $1,000 = 1,000,000

Therefore the water cost savings are **$48,000** per annum

Fuel savings

The fact that the WRMs are located at the central positions within each zone means that the Pumpers (trucks) need to travel less distance to get to the drill site to begin pump skills training/maintenance sessions.

On average each truck would have a saving of 50 kms per drill which equates to a fuel saving of $50 per session. Five sessions per week equates to $250 per week therefore **$13,000** per annum.

Total savings

Total savings on water and fuel costs **$61,000** per annum

Risk Management

The WRM has significantly reduced manual handling issues with regards to core skills maintenance pump training. The innovative design has eliminated the need to pick up and move equipment on the training ground as these features are incorporated in the WRM configuration. This has made the operations involved in its use much simpler, ergonomic and safer.

The WRM has largely eliminated the possibility of foam contamination into drains and water ways by containing foam emissions from the trucks. Any spills are contained within the module which can be more easily disposed of than from the ground.

Discussion/Evaluation

- Currently the 4 Modules are within the Operational Zones for Fire-fighter core skills maintenance.
- Module Locations :- Sunshine, Burwood, Thomastown & Richmond
- The Water Recycling Modules have now been completed and in use at four MFB zones throughout the Metropolitan Area, These modules have now been fully integrated into the formal skills maintenance programs running within the MFB and provide fire-fighters with and excellent training apparatus to complete their required core skills maintenance session on pump operation.
- The Modules within the MFB zones have formed the central component for skills maintenance sessions while maintaining corporate environmental policies to reduce water consumption and to effectively increase fire-fighter training by 200 %.

- Training yearly planners have now been developed that incorporate an number of sessions working with each of the Water Modules, decreasing travel time to drill sites keeping more vehicles available for emergency response.
- In 2011 it is expected that three recruit courses of 24 participants (72 Total) will be integrated into the MFB workforce and each one of these recruits will need to complete 6 hours of pump operation utilizing the Water Recycling Modules to gain competencies throughout their first year within the MFB.
- The Water Recycling Module program has been significantly instrumental in the MFB reducing its water use by over 15%. The actual figure is 21%.
- Interest from interstate Fire Services in the Module Design, Use, and implementation has been shown, particularly by the South Australian Fire Service
- The module design has addressed the reduction of manual handling issues.
- Procedures and design of the module significantly reduces the chance of foam contamination into water ways and drains.
- The WRMs are the fore runner to the proposal/consideration that each fire station may contain a fixed WRM in their training yard and incorporated into future Fire Station design.

Return on Investment

The return on investment has been quite impressive.
Taking the cost of the WRM manufacture as an average of $112,000 (The cost varied from an initial $116,000 to the final 4th unit at $108,000 due to competition between tenderers) then with projected minimum cost savings of $61,000 on water and fuel costs each of the four WRMs is virtually paid off every two years. For the ongoing benefits on water and fuel savings this is a commendable result.

There is also an additional benefit in using the WRMs which is difficult to cost but of enormous potential benefit is a fire crisis situation and that is the significant increase in opportunities for fire training as a result of the ability to use fully recycled water. This allows for expanded fire training programs to be developed for skills training without the concern of wasting water in the process. An increase of 200% is a conservative estimate of the benefit of using recycled water in training drills.

Conclusion

This project has been successfully concluded with spectacular results in reducing water usage and in training of fire fighters and in testing of fire pumps on fire fighting vehicles. The outstanding results obtained from the SWF funded WRM has been multiplied with the production of the additional three WRMs.

Recommendations

It is recommended that the performance of all WRMs be monitored in regard to water saved and that consideration be given to installing a modified fixed version of the WRM in fire stations that are either being rebuilt or refurbished.

References

N/A

Acknowledgements

This project could not have been achieved without the drive and input from Garry Watson who initiated the original prototype and as such was able to demonstrate the enormous water saving potential of the WRM. Garry was ably assisted by Paul Emsden during the arduous operational aspects of having the prototype WRM tested under full operational conditions around the various fire stations which provided invaluable data on the performance of the WRM.

Additional WRMs were able to be manufactured firstly because of the generous grant made by the Smart Water Fund Round 5 which resulted in the first fully operational WRM now stationed at the Thornbury Workshops.

Three additional WRMs were manufactured as a result of additional funds being made available by the MFB to complement the SWF funded WRM.

SWF staff also provided support and made themselves available for testing and inspection of the WRM. These included Ms Zoe Snowden and Mr Dale Alsford in the early stages of the project and more recently Ms Tanya Rattray who performed the final inspection at Thornbury Workshops with Ms Kate O'Dea

Thornbury Workshop Manager, Mr Albert Lindner made the SWF funded WRM available for use at the fire stations whenever requested.

Mr John Filippou from the MFB Fleet Department provided input to the update of the original Fleet specification and in the fit out of the WRMs as they were delivered from the manufacturers.

Appendices

Appendix 1: Water Recycling Participant Evaluation

Appendix 2: Modifications incorporated from Evaluation Feedback

Appendix 3 Water Recycling Module Operating Instructions

Appendix 4: Water Savings data from WRM rotation at Fire Stations

Document Status

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1.0	Eugene Antczak Garry Watson	7 January 2011

Appendix 1: Water Recycling Participant Evaluation

Metropolitan Fire Brigade

Water Recycling Module

May - July 2008

Water Recycling Module

Participant Evaluation

Evaluations received: 240

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1. Which Type of Vehicle was used in the trial?

Mk 3	MK 4	MK 5	WT	TB	OTHER
4	25	189	6	4	11

2. How can the water recycling module be improved?

- Larger catchment for monitor.
- Easier access for refuelling pump.
- Water catchment area to incorporate ladder platform.
- Great job, well done.
- Small container of oil for the R/pump be placed on the pod. Otherwise I feel the wrong engine oil will be placed into the engine
- Maybe an ultra large pump.
- Maybe a chart fitted on the side of the module showing various pump outflow rates for given revs.
- The use of non-painted deflectors for branch streams i.e. aluminium or galv. As any paid coatings will ultimately be stripped off over time.
- Each Pod commissioned should be named after a significant person in our industry ie Peter Marshall.
- It would be good if we could return water via the aerial appliances (ladder platform) thus allowing pump operators to simulate what would be required of them at a large incident.

- Module would be great for PR if used at Friday displays at FS1. If there was some way of using hose reels from a remote location, we could again allow the kids that visit to have a squirt to complete their experience.
- As the new recruits now have to use the ground monitor as part of their drills, it would be good if we could also catch this water.
- Magnetic signs with use-by-dates should be placed on the outside so you don't have to open the back to read them.
- Replacement of 'water change sticker'.
- While obvious, maybe a sign stating that the water is not fit for consumption could be placed on the pod.
- Hose connections at ground level.
- Large hole in front covered section for aerial appliances ie hinged lid.
- Outlets for suction due to site problems ie station confines/parking – either on the front, back or sides.
- Having a hopper type funnel for the teleboom and/or monitor to aim into. Having a fill only delivery.
- Improvements have been addressed.
- Colour code the couplings on the module feed lengths (feeds and deliveries) to match the colours on the MK5 pumper ie.orange for deliveries and green for feeds. Widen the mouth where the monitor points its jet into the module.
- New pump, move inlets lower, as already suggested would be a great improvement.
- Nothing comes to mind.
- I think the module was user friendly and worked extremely well.
- Maybe petty but a water fill marker that can be seen clearly when standing back from the pod, rather than looking into it to see if it's full. May help to cut down on overfilling and water waste, could be as simple as a float and a marker.
- Paint the inside of the module light blue so the water colour/quality can be better assessed Millcock type connections on the deliveries of the pump a simple pump operation panel away from the monitor stream delivery connections lower down a suction connection in each side.
- No, great as it is.
- Pump should remain at rear of module but a separate pump control panel, (similar to a water tanker), deliveries outlets and suction inlets go to the front near the hook point for the transporter – less noise and less room required at station to operate provide lighting to pump panel, delivery connections lower, sight gauges to see water level, bracket to hold a ground monitor, hose reel to empty water, water gardens etc, compound gauge on pump, flow meter on pump inlet which shows total water savings.
- As indicated by instructors, a bigger cowl type arrangement would decrease water lost when using the monitor.
- By using a permanently fixed pump with an automatic pressure governor and manual override as lie the one found on the Mark V Pumper. This would allow it to simulate different pumping conditions when in manual mode or when in auto it would make it easier for normal pump drill by keeping a constant supply of water.
- Move suction inlet valve from top of module to connection that suction hose fits to.
- Lower height of couplings for branches and fit of in side of module. Warning to ensure enough clearance around couplings so that hand does not strike anything when using hose key.
- Place ABC keys on door to make more accessible.
- If retaining side steps, make them spring loaded so they return to the closed position to prevent trip hazard.
- A great idea and practical modifications required bigger hopper for the monitor.
- No tailgates when the fixed pump is attached.
- Outlets to the edge of the module.
- A better ladder for access.
- Branch couplings lower or angled down.
- Overall a good project, worthwhile – well done.
- Looks good at this stage, perhaps after we have used them a bit there may be some tweaks we could do but for now, fine. Good work fellows.

- Sight glass to main water tank to show water level. Supply pipe Isolation valve lever re-located for easier access. Addition suction out-let with gate valve for open water drill.
- Diving platform
- Tonneau seemed to catch water, an angled solid lid could let water run back into the module instead of onto the operator as demonstrated by Paul Emsden.
- Foam Bucket
- Governor for pump?
- Visual water level marks on the outside of the pod. In increments of 500 to 1000lt.
- Increase the size of the catchment area for the monitor to prevent loss of water from spray.
- Excellent piece of equipment well thought through.
- It needs a stortz suction 125mm coupling put through the front near side metal work (hook end) down low, so as you can do open water suction drills without trying to bend a set of suction hoses over the top of the module (over the metal work which may damage the suction hoses or place the connections under strain).
- It was great.
- More protection for Rosenbauer motor from monitor
- By putting all the controls, suction/feeds on the side so no water gets on them
- A 125mm connection would be useful for open water pumping to avoid disconnecting the hose into the rosenbauer pump for this drill.
- Suggestions put forward already will improve the module. The module works well.
- I was very impressed with the water module. Apart from the changes that will be made when the pump becomes a permanent fixture, I didn't think it needs any more improvements.
- Some kind of tarp or cover to minimise the water spray of splash over from the top of the module when in use.
- No improvements necessary, keep it simple.
- Fit an open water outlet in the side of the pod this could be fitted to an upright elbow giving the operator a change to get lift. Larger water inlet shields on the top of the pod to reduce splashing and to aid in water savings when aligning the stream from a monitor. Lower inlet couplings points set in the side of the pod would be safer and negate the need of the side step. The idea of having a tanker pump with corresponding pump panel would increase the value of the training experience. A "Water Saved" gauge on the pod so crews could report the water saved over time by using the pod. This would help with environmental reporting that the brigade has to do.
- Fixed pump to prevent loss of pump.
- This is just an observation and not sure if it will ever be a problem, or what a better alternative would be, but it is possible that the storage of the suction hoses could present a problem due to the fact that they stick up over the highest point of the pod? Obviously when pod is in use, it shouldn't present a problem, but what about storage of the pod. As the pod is considerably smaller than most other pods in use, is it possible that it will be stored differently it. Tucked away somewhere? If you end up using a different pump so that the front section of the pod is configured differently, would it be possible to store the hose there, running across the width of the pod? Great imitative Watto. If we ever get around to naming pods after MFB personnel, I'll be suggesting that your name goes on one of them!
- Should be more user friendly, e.g. diving board.
- The panel the water is squirted onto should be stainless or alloy plate. This would resist rust and not require painting therefore avoiding paint flakes in the water which without filters will cause pump damage.
- Straighten the branches so that the water is deflected into the tank area. Fill couplings in the front up above water level short foam pick up tube 7 foam bucket great project it works well.
- To make pod more useable in a small area it should have the return Shute located at the front where access is required to pick up and place down the pod. This would allow for minimal area required at the rear of the pod.
- It took a bit of time to fill the module to a level that enabled the pump to operate. Is there any benefit to having the bottom angled up toward the middle which would see

the module useable in a quicker timeframe? This would still enable outlets from the bottom around the sides.

- Worked well!
- Nil. Seems to work very well.
- Maybe a fold up lid over the Rosenbauer pump, instead of the tarp cover which will constantly need repair.
- No improvements required. It is fantastic to have the opportunity to use the pump both for as a feed and delivery device.
- A bigger suction connection at the rear where the outlet is.
- Bigger capture point for the monitor.
- Remote control for the throttle on the rosenbauer pump.
- Sight gauge for water level.
- Investigation of ways to reduce spray drift from the monitor. Combined with a higher deflector plate to allow branches to be held and directed at the plate if required.
- The rosenbauer pump should be housed at the opposite end to the return baffles – it will only take one operator error with the monitor pointed to destroy $30K of pump. No great difficulty to walk around the module to adjust the pump (or put remote control at the opposite end).
- The method in which the water from the monitor is bombarded onto the metal flap is a little basic. Perhaps a more efficient, larger style cone flap. Otherwise it is a good piece of user friendly equipment.
- Larger pump.
- Water gauge on outside of pod.
- Controls to pump on side of module instead of rear.
- Have a module sited at all larger stations in northern that way it would be easier to get stations in for a drill and not rely on transporters and move ups.
- Signage on module indicating to the public how much water saved – sandwich board etc can be displayed away from the POD.
- Sponsorship from water companies & community partners.
- Carry out drills in areas like the TAN, Government House Drive to visualise commitment.
- Experience and design flexibility for improvements ie can it be made galvanised or aluminium?
- Can walls be modified to facilitate multi use as in mass CBR drills or adaptability for bulk foam?
- A couple of CFA adaptors so the CFA crews can use/familiarise themselves with the MFB crew present on a Sat/Sun morning? Joint agency stuff.
- Better water catching facility for monitor use.
- Vinyl cover for this area may not be sufficiently resilient.
- Change to position of the inlet for the monitor to the side, this will mean for a MK5 the truck will have to park along side the module.
- The two feed from the rosenbauer pump can go into the other panel and you will have less of a trip hazard around the primary pump panel. It will stop any damage to the pump and cover and give access to the pump when the monitor is in use.
- More protection for Rosenbauer operator required when using monitor.
- Some form of foam simulation container. Possibly a collapsible 50 litre container drawer like a MK5 to hold all tools and adaptors.
- Perhaps the positioning of branches could be altered so that the unit could be used in a more confined area.
- Without further drill sessions, it would be difficult to evaluate the need for further improvements.
- Larger volume pump.
- Labels “not suitable for drinking” & “for training use only”.
- Signage on POD stating “not to be moved while containing water”.
- A more solid deflector and inlet for the aiming of the monitor.
- Larger opening/catchment is required when using a monitor.
- If the left hand side high pressure reel clamp was not aimed at the internal tank ladder, there would be significantly less spray mist produced while using high pressure reels.

- Maybe a workshop module could have an electric motor (three phase) instead of a diesel engine. Would eliminate the problems of refuelling, not starting and general servicing.
- Provision for a small reservoir of water to be used for simulating foam production. This reservoir would need to be visible to enable the operator or instructor to observe that the water (foam) was being induced into the pump.
- Bigger suction point at rear.
- Paint the inside blue to monitor water quality.
- Litres per minute chart eg 2000RPM = 1500LPM
- Magnetic water recording moved to outside of module.
- Enclose the motor to cut down the noise.
- Remote control for the installed pump with the main pump panel in cabinet.
- Worked very well.
- Make the pump module quieter so that the only noise you hear is the pumper increasing and decreasing rev's as things happen. This would make it more realistic and enable students to learn what to listen out for when operating at a fire.
- Extra suction hose so you don't need to disconnect the rosenbauer.
- Add controls so one can operate the rosenbauer pump remotely.
- Sound proofing around the pump.
- Relocate rosenbauer to the other end to reduce noise.
- Turn the monitor water catcher around 180 degrees so the monitor is operated from where the transporter drops off the pod. This way the pod can be reversed into a corner at the back of a station out of the way and still be useful for training eg space is fairly tight at the rear of FS01 and in the current configuration the water pod needs space at the front for the transporter to the pod off, and space at the rear to get a pumper in to operate the monitor.
- The ability to recycle water operated by the ground monitor would be an added benefit.
- Put a shroud around pump to reduce noise.
- Water catch plate to be conical or at least curved to avoid extra splash and water waste.
- Pump should be encased and only the outlet/inlet and the pump controls visible.
- In terms of costing, does the water containment part of the pod need to be metal? What about plastics? This would also alleviate any problems of rust and would probably wear better. Would also lighten the pod dramatically
- Adding a high rise booster type connection and a Perspex sleeve whereby for examination purposes you have the ability to insert different cards to change the scenarios.
- Fixed pump with external panel pump to be enclosed and insulated to reduce noise.
- Reduce Noise.
- Quieter pump with greater capacity than the rosenbauer.
- Fixed pump installation with an outlet and control bank.
- Consider rerouting the current exhaust system as it has a noticeable smell.
- A bigger fixed pump.
- Round of where water enters the module to limit water spray of blunt surfaces.
- Have a water level gauge.
- A modification to allow hand held hose lines, ground monitors and the roof mounted monitor to be angled in from different directions would allow for some more varied drills.
- If it possible to develop a system whereby the water can be easily and quickly chlorinated against bacteria so it can be recycled for longer periods; it would be worth looking at for water saving. Other than this, the module is an excellent idea and will be a great asset in getting regular pump drills done.
- If you had the pump at the other end it wouldn't be so noisy.
- Larger catchment area.
- Access to the tank via a ladder.
- Mesh over the water to stop anyone or thing falling into it.
- I do not like the location of where hose lines connect to branch potential for them blowing and hitting a person from chest upwards.

3. Did the Rosenbauer Pump deliver enough water flow rate for the drill?

Yes	No
175	31

COMMENTS

- A little more would have been better.
- Cannot see any use for over 3000 to 3500 LPM (one monitor at reasonable flow + 2 lines).
- If a particular drill required more water then a second appliance could be used on the suction connection which would also allow us to practice relay pumping.
- Needs bigger pump to accommodate for monitor = other deliveries. A bigger hoper to catch more monitor water, although this would make it higher.
- Pump capacity not equal or better than the appliances we use. The pump did supply enough flow for drill purposes though.
- Larger if possible and quieter.
- Water flow ok but we haven't tried it with the teleboom yet.
- Hard to be sure without running the monitor during the trial.
- It was enough but a GAAM MK450 would probably be better.
- About 3000lpm would be good – HATZ diesel?
- Not sure if it would be enough if drilling with the Boom and handlines. But not sure how often we would be doing that anyhow.
- Why do we need the pump at all, as every truck that attends the drill has one on board? All you do is have one pumper connect to the stortz suction coupling I have suggested in above comments and feed supply to the other vehicles. This would reduce the cost in supplying a portable pump to the unit & add the dimension of open water/positive pressure pumping & relay pumping to all drills. Yes we do usually have at least two trucks at each drill capable of pumping water.
- Pump capacity seemed fine.
- It's ok for all of the operations.
- From my understanding, it would struggle to run multiple deliveries and a monitor. Ideally the pump capacity would allow this flexibility when drilling.
- Only require larger if there really is a need to run several 65's plus monitor, plus h/r's all at once.
- About 3000 litres would be good.
- .Try to upgrade by about 25% enough for monitor and two hose lines.
- Volume to meet any appliance.
- Over ran supply when using monitor which is to be expected. Perhaps increase supply to 3000lpm.
- Clearance lights that are solar powered so it doesn't drain battery.
- Great idea – congratulations to T & E – probably the best thing to come out of Burnley this year.
- 3000LPM is a better pump capacity.
- Try the pump mounted on water tankers.
- More than 2000 would be good.
- If a pump was used like the WT pump, it could be enclosed to cut down noise.
- Have operating controls like on the water tanker so you wouldn't need to get into the area of the pump to start etc.
- No 3000 would be better than the rosenbauer.
- For the purpose of this drill the pump worked well.
- Position the rosenbauer pump further away from the pump so the engine noise is not confusing.
- Up to 5000lpm

- Could not handle the monitor, may be a little larger.
- Larger pump needed.
- Capacity needs to be increased to allow the appliance to operate near maximum.
- This should be determined after continued training has determined the satisfactory use of the pump.

4. Is there any other equipment required to be stored on the module?

- Spray jackets and drinking water.
- Phosojet modulator should be compulsory.
- One or two new recruits should be stored permanently within the module so as to accommodate setting up and 'make-up', as well as for making coffee etc.
- Possibility of a stand for the pump operator when the vehicle is parked as close to the module so as not to slip on the hose.
- For safety purposes, maybe written signs could be put out for display.
- Is it possible to treat water to use for longer periods? 7000 litres by 5 pods every 5 days is a lot of water.
- Oil & bucket.
- Laminated copy of pump drill procedures.
- Nothing comes to mind.
- Adaptor for connecting the high pressure cleaner so we can use the old water to wash appliances.
- Could the module be used as a "quick fill point" at a static water source to supply water to MFB/CFA/DSE water tankers during a major bushfire? Could it support state aircraft operations in refilling fixed wing bombers at airbases where no water is available and water has to be ferried in? If there was a longer term requirement to relay water (perhaps even to help out local environmental/ wildfire groups) could one of these modules be utilised for water relay purposes instead of an operational appliance.
- Suction adaptor for water tankers.
- Oil for the Rosenbauer
- A fold away container would be good so as it can be used during foam drills (simulate foam stores).
- Its own Shell card? May end a pain if always using petty cash.
- No, very impressed with the design. Congratulations to those involved with the 'Watson Wagon Wheel'
- No, all equipment that is required is currently stored on WWW.
- Dry chemical extinguisher be fitted to provide fire coverage during refuelling and portable pump operation e.g. if no pumper present.
- Maybe some form of branch/nozzle to assist with watering gardens when emptying the module before transporting.
- No, not that I can think of at the moment. One of the better design fire brigade pieces of training equipment.
- Earmuffs with the talkback feature.
- Parks & gardens adaptors for all councils.
- Excellent concept.
- One of the water powered submersible pumps would be good as an activity to do whilst using the pod.
- I don't think so.
- No, however consideration for this unit to be used as a base for water stowage in grass-fire, wildfire situations over summer.
- Important to maintain the unit as independent training resource; not relying on operational equipment.
- Funnel for the oil on the Rosenbauer.
- Storz keys.
- Perhaps a sheet with different pumping scenarios that may challenge pump operators. Similar to the level 1, fire fighter drill book.

- Have a drum of bio-degradable dishwashing liquid on it so we can simulate foam production through the pumps.
- Suction outlet above water line, with hose and filter inside tank at the bottom.
- Foam bucket.
- Plastic “recycled” water signs.
- Bucket and foam pick up hose
- Better recycled water signs.
- Drill foam.
- Hose roller
- Ear Muffs.
- For night drills – small flashing light as carried on car 370 at number 16 station.
- Remote control for Rosenbauer pump.

OPTIONAL QUESTION – Added to survey 27/06/08

Are you prepared to assist further: **YES**

Appendix 2: Modifications incorporated from Evaluation Feedback

Modifications carried out at MFB Workshops on Prototype

Modification	**Reason**
External Water Sight Gauge	External Visual Water Level
Fill Couplings on both sides	Quicker fill, no back pressure
Reposition Fuel Containers to the front of the module	Remove from cabinet to allow for onboard pump controls
Fire Extinguisher	Because it carries fuel and extinguisher is required
Removal of rear Tailgate	A bi-fold gate at rear will be fitted at Shirzal. No Lifting required.
Removal of side Tailgate	As we have a fixed Pump no need for a ramp to remove a portable pump, New flip down access panel to be made and fitted by Shirzal
Removal of small shelf in cabinet	Relocated all hose to the bottom of the cabinet Allow for Equipment to be stored more ergonomic
Relocate Hose /Equipment	Reposition Hose Keys and equipment for better location
Gas struts fitted to cabinet	To keep open cabinet door to operate the pump controls without the door closing or moving in the wind.
Fit GAAM Mk 500 Pump (Similar to the WT pump)	Position, Locate and wire up the Fixed Pump, this pump produces up to 3000 lpm a 50% increase on the rosenbauer pump. Major noise reduction , No manual handling of Pump
Fit GAAM Pump Control Panel into cabinet	Covered electronic panel Remote control option No working under monitor flow Easy to read and operate Gauges and Controls Night light- Panel illumination
Fit and wire up Remote Control pump controls	Pump controls can be operated at the Pumper Primary panel without moving away from student or firefighter operating pumps. Shut off switch for emergency shutdown
Relocate the “RECYCLED WATER IN USE” signs	Locate signs in easier location
Provide a flexible 100mm hose from capture area to pump	Provide 100mm couplings and fitting standard to MFB Equipment and sizes
Provide Gernie/Karcher adaptor	for the use of the water to wash trucks and station with water after a drill
Provide 100mm to 125mm adaptor	To allow water tankers and Pumpers to utilize the “open water” drill facility

“Water Not FitFor drinking” signage	Stickers on each side of the module
Empty Water before Transporting Module	Warning Signage for Transporter operators before transporting module.

Modifications for Shirzal to fabricate on Prototype

Modification	**Reason**
Rear Bi-Fold Tail gate	A hinged Bi fold Door at the rear. Better operator access to fuel and connections No Lifting No Trip hazard More Ventilation
Side Drop down access door for couplings	A half drop down door for access to the couplings for feeds and deliveries. Access to shut off valve
Reposition pipes to the branches to a lower height	Relocate Pipes for the couplings to the branches. Have the connections for the Off Side to be lowered and come out of the rear. Lower the Nearside couplings to allow for connection via access door. Angle couplings down , so if a hose blows the hose moves downward not at head height.
Provide a Metal cover over the pump	Remove the tonneau cover and replace with a hinged cover allowing for room to work for Workshop repairs. Provide a sturdy cover for the pump
Supply and fit a 125mm suction point at the front of the Module	Fit just above water level between shoulder and waist height for manual handling regulations
Increase the size of the Monitor chute and bring forward and have sides	The monitor Chute to be made with sides for spray control and to extend the chute towards the rear , better capture of water
Fit 125 mm out let at rear with a shut off for open water drills, tank drain	Increase the pipe size to 125mm with a shut off , instead of just the 65mm drain valve. To allow for open water drills at the rear.
Re-fabricate nearside lift up access lids- Under mesh to stop water splash.	Apply under the access lids a mesh to stop water spash from module.
Design and Fabricate Secondary Monitor Hatch	Use gas struts to assist the lifting of the hatch Non slip area for foot placement

Monitor direction from the front of the module	
¾ inch drain Valve to be fitted to bottom nearside	Allow for fall of land so there is a drain at either end

Modifications already adopted

Place pump oil container on Module

Signage to indicate (water not fit for drinking)

Module fill point at front of module.

Signage for transportation (Empty water before transporting module)

Adaptor for high pressure station cleaner.

Funnels for oil and fuel fills.

Suction adaptors for water tankers.

Modifications to be adopted

Increase original monitor capture area.

Incorporate monitor capture for aerial appliances.

Incorporate side capture for ground monitor or hand held lines.

Pump revs V pressure chart attached to module.

Manufacture monitor and branch capture areas from some non rust material.

Water usage and fill date sign to placed on outside of module (clear view)

Add 125mm suction outlet to front and rear of module.

Fit new higher rated pump.

Lower all hose couplings to between knees and shoulder.

Angle all couplings to 15 degrees down.

Clear working space around all coupling for hose key use.

Fit exterior water sight gauge.

Coat inside of module light blue (for water clarity and vision)

Main pump panel to be located in cabinet, away from water stream.

Pump to be located at rear.

Water proof pump area / covered.

Remote pump control system.

Place all coupling and keys in slide drawer (as per mk5)

Remove both tailgates OH&S

Bi-fold mesh door at rear.

Fold down coupling access door panel on side.

Tank pickup to pump isolation valve to be repositioned.

Collapsible foam bucket.

Fit grilles under inspection panel to reduce splash and spray.

Add cfa adaptors.

Re visit signage, (both recycled water and trip hazard)

Dry chemical extinguisher.

Storz hose keys 2

Park and garden pump to storz adaptor

Include disposable ear plugs in cabinet.

Changes for future consideration

Include de-foaming agent

Book of pumping drills and scenarios.

Synthetic foam (dishwashing liquid) for foam simulation?

Hearing protection, with talk back feature.

Laminated operating procedures.

Re-aim high pressure reel so not to strike ladder.

Electric motor or pump for w/shops configuration, to save fuelling.

Lower branch heights, to lower overall configuration of module.

Consider permanent position for pods or exclusive use stations. (won't be useable at all sites.)

Signage or gauge on pod to indicate to public how much water is, or has been saved. This could also be used as a reporting mechanism.

Foldable lid to give water protection for pump.

A front monitor chute to give module flexibility in confined spaces.

Suction hoses should be no higher than the pod.
Consider mounting suction hoses horizontally instead of vertically.
Governor for the rosenbauer or fitted pump.
Governor would keep constant flow / pressure for pump drills.
Flow meter on pump inlet to show total volume of water pumped, or litres saved.
Bracket to hold ground monitor.
Millcock style connections on pump delivers.
Different style of “water change” recording.
All hose connections at ground level.
Incorporate ground monitor usage and catchment.
Involve two appliances pumping from pod, to simulate relay pumping.

Modifications considered but not adopted.

Use an ultra large pump.
Colour code pod connections the same as mk5.
Suction and delivery outlets to all run to the front of the pod.
Spring load the side steps so they are not a trip hazard.
Install a diving board
Angle to bottom of the module to reduce amount of water required to fill it.
Move pump away from monitor stream to prevent possible damage.
Gain sponsorship from water companies or community partners.
Remove the pump to reduce costs, as every fire truck already has a pump.
We could relay pump to reduce need for module pump.
Solar powered clearance lights on module.
Spray jackets and drinking water supplied.
Phosojet modulator should be compulsory.
Recruits stored permanently with module to aide in setup.
Raised standing area for pump trainer to keep them out of the water and trip hazards.
Treat water to increase life before refill.
Allocated shell card to avoid using petty cash.

Allocate a branch / hose to assist with the water re-use when watering gardens.

Alternative suggested uses for WRM

Friday displays at Eastern Hill

At remote locations, so children can squirt water back into the module.

Carry out pump drills in high visibility areas to display us to the public.

Modify to use in mass CBR drills / or adapt to fill with bulk foam.

Use as static water point in wildfire to fill any fire appliances. DSE CFA MFB etc

Use as water relay point if assisting environmental or wildlife groups.

Could be used with a submersible pump, as a drill.

Maintain it as a training resource, not operational equipment.

Other general comments.

Great job, well done.

I was happy with it.Improvements have been addressed.

I think the module was user friendly and worked extremely well.

I think the module was user friendly and worked extremely well.

No, great as it is.

A great idea and practical modifications required

Overall a good project, worthwhile – well done.

Looks good at this stage, perhaps after we have used them a bit there may be some tweaks we could do but for now, fine. Good work fellows.

Excellent piece of equipment well thought through.

Suggestions put forward already will improve the module. The module works well.

I was very impressed with the water module. Apart from the changes that will be made when the pump becomes a permanent fixture, I didn't think it needs any more improvements.

No improvements necessary, keep it simple.

Great imitative Watto. If we ever get around to naming pods after MFB personnel, I'll be suggesting that your name goes on one of them!

Nil. Seems to work very well.

No improvements required. It is fantastic to have the opportunity to use the pump both for as a feed and delivery device.
Otherwise it is a good piece of user friendly equipment.
Without further drill sessions, it would be difficult to evaluate the need for further improvements.
Hard to be sure without running the monitor during the trial.
Pump capacity seemed fine.
Its ok for all of the operations. this flexibility when drilling.
Great idea – contratulations to T & E – probably the best thing to come out of Burnley this year.
7000 litres by 5 pods every 5 days is a lot of water.
No, very impressed with the design. Congratulations to those involved with the 'Watson Wagon Wheel'
No, all equipment that is required is currently stored on WWW.
No, not that I can think of at the moment. One of the better design fire brigade pieces of training equipment.

Appendix 3 Water Recycling Module Operating Instructions

METROPOLITAN FIRE BRIGADE

Appendix 4: Water Savings data from WRM rotation at Fire Stations

Water Recycling module Water Use & Water turnover				2009		start
					If we filled	Pump Hrs
Date	Filled Litres	Recycled litres		Reason Emptied	each day	11.1
21/05/2009	5,000	80,000			5000	12.1
22/05/2009	1000	60,000			5000	12.9
25/05/2009	5,000	40,000		Wash USAR	5000	13.4
27/05/2009	2,000	40,000			5000	13.8
2/06/2009	5,000	70,000		Wash USAR	5000	14.5
12/06/2009	5,000	40,000			5000	14.9
15/06/2009	1,000	60,000			5000	15.5
16/06/2009	5,000	40,000			5000	15.9
17/06/2009	1000	30,000		USAR Water Tank	5000	16.2
29/06/2009	5,000	70,000		N0.1	5000	16.9
30/006/09	1000	70,000			5000	17.6
1/07/2009	1000	130,000			5000	18.9
2/07/2009	5,000	80,000			5000	19.7
4/07/2009	1000	220,000		4 Days	5000	21.9
5/07/2009	1000	110,000			5000	23
6/07/2009	5,000	150,000		Move pod	5000	24.5
7/07/2009	1000	250,000		No.7	5000	27
8/07/2009	1000	110,000			5000	28.1
9/07/2009	1000	60,000		4 Days	5000	28.7
10/07/2009	5,000	130,000			5000	29
11/07/2009	1000	30,000			5000	29.3
12/07/2009	1000	40,000			5000	29.7
13/07/2009	1000	140,000		4 Days	5000	31.1
14/07/2009	5,000	280,000			5000	33.9
15/07/2009	1000	120,000			5000	35.1
16/07/2009	1000	60,000			5000	35.7
17/07/2009	1000	50,000		4 Days	5000	36.2
18/07/2009	5,000	340,000			5000	39.6
19/07/2009	1000	40,000			5000	40
20/07/2009	1000	60,000		4 Days	5000	40.6
21/07/2009	5,000	390,000		TB Course	5000	44.5
22/07/2009	1000	380,000		TB Course	5000	48.3
23/07/2009						
24/07/2009						
25/07/2009	5,000	30,000			5000	48.6
26/07/2009	1000	30,000			5000	48.9
27/07/2009	1000	20,000		4 Days	5000	49.1
28/07/2009	5,000	30,000			5000	49.4
29/07/2009	1000	80,000			5000	50.2
30/07/2009	1000	10,000			5000	50.3

31/07/2009	1000	60,000		4 Days	5000	50.9
1/08/2009	5,000	50,000			5000	51.4
2/08/2009						
3/08/2009	1000	90,000			5000	52.3
4/08/2009	1000	60,000		4 Days	5000	52.9
5/08/2009	5,000	120,000			5000	54.1
6/08/2009	1000	180,000			5000	55.9
7/08/2009	1000	160,000			5000	57.5
8/08/2009	1000	260000		4 Days	5000	60.1
9/08/2009						
10/08/2009						
11/08/2009	5000	200,000		Continuation 96	5000	
12/08/2009	3000	200,000		Continuation 96	5000	64.1
13/08/2009	0	0	0	0		
14/08/2009	5000	90,000		Move pod	5000	65
15/08/2009						
16/08/2009						
17/08/2009	5,000	150,000			5000	66.5
18/08/2009	1000	140,000			5000	67.9
19/08/2009	1000	100,000			5000	68.9
20/08/2009	1000	120,000		4 Days	5000	70.1
21/08/2009	5,000	80,000			5000	70.9
22/08/2009	1000	50,000		Dirty water	5000	71.4
23/08/2009						
24/08/2009	5,000	70,000			5000	72.1
25/08/2009	1000	120,000			5000	73.3
26/08/2009	1000	40,000			5000	73.7
27/08/2009	1000	20,000		4 Days	5000	73.9
28/08/2009	5,000	100,000			5000	74.9
29/08/2009	1000	50,000			5000	75.4
30/08/2009						
31/08/2009	5,000	40,000		4 Days	5000	75.8
1/09/2009	1000	60,000			5000	76.4
2/09/2009						
3/09/2009	5,000	70,000			5000	77.1
4/09/2009						
5/09/2009	1000	150,000		4 Days	5000	78.6
Sept	Recruits	& No 1 Stn	& Instructors Use			
28/09/2009	15,000	940,000		4 Days x 3	15000	88
2/10/2009	2000	80000			5000	88.8
Date	total Lts Filled	Total recycled	Total emptied			
	181,000	7,820,000	0		325000	

22/01/2010						115

Date	Pump Hours	Minus 79 Hours		@100,000		
22/01/2010	115	36		3.6 Mega Litres		

8/02/2010	125	46		4.6 mega litres		

As of April 2010 the original water Recycling Module had Recycled approx 15 Million Litres