Extended Abstract

The Establishment and Use of Containerised Wash Units for Oiled Wildlife Response in New Zealand

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Abstract: New Zealand is an island nation with a coastline of over 15,000 kilometres (MAF 2009). Although risk assessments indicate that New Zealand can expect a marine oil spill of significant proportion every 100 years, and areas have been identified as higher risk (MNZ 2009), it is difficult to predict which areas of coastline are likely to be affected by oil spills. This unpredictability means that the location of any permanent purpose built wash facility with the capacity to decontaminate and rehabilitate wildlife affected by an oil spill would be highly contestable. To overcome these difficulties, DWYERtech Services Ltd, in conjunction with the New Zealand Wildlife Health Centre and Maritime New Zealand has developed a containerised mobile washing system. This system allows an oiled wildlife wash facility to be dispatched onsite anywhere within New Zealand to be integrated into existing infrastructure and be operational within 30 minutes of arrival. This paper outlines the versatility, ease of establishment and functionality of the system and includes a selection of example sites throughout New Zealand to demonstrate how the mobile containerised wash unit can be used effectively as part of a larger oiled wildlife response facility.

Introduction

The New Zealand Wildlife Health Centre (NZWHC) is contracted by Maritime New Zealand to build and maintain an oiled wildlife preparedness and response cabability for New Zealand. This contractual obligation not only covers New Zealand's main three islands (the North, South and Stewart Islands), but also stretches up to some 1000 kilometres away to include the Chathams, Kermadecs, and several subantarctic islands. Furthermore, the long and rugged coastline of even mainland New Zealand has limited or no access in many areas. In the event of an oil spill, implementing an oiled wildlife response may be extremely difficult not only due to the rough terrain, but also by the lack of facilities in remote areas.

Recognition of the need for a flexible oiled wildlife response capability has resulted in evolution of a mobile wash unit to the current containerised facility.

Evolution of a mobile wash unit in New Zealand: 1998-2009

New Zealand's original mobile oiled bird wash capability consisted of several self-supporting wooden framed stands that became the centre piece of our oiled wildlife

response. One frame was set up with power outlets and a pressure-reduced water supply that fed into an additional two stands, each containing a Bosch High Flow™ instantaneous gas water heater. Both stands contained two liquid petroleum gas (LPG) bottles seated at the rear of the frame. LPG was piped to the front via an auto-change regulator, allowing quick change between bottles when one runs out. Each water heater supplied water to two wash stations via flexible plastic hosing connected to hand held shower units.

This equipment was used for several oil spill responses between 1998-2002, including the Jody F Millennium grounding off the coast of Gisborne in February 2002.

The Jody F Millennium incident was the first time DWYERTech Services were involved in an on-site spill response, and this offered the opportunity for evaluation of this system in a real event. During this response, a wash station was set up in a local community centre. In order to protect the new concrete floor, a contained bunded area was constructed using timber frames and tarpaulins inside the pre-existing building. Four wash-stands were set up in this area, fed by the two Bosch™ water heaters that were positioned outside of the building to eliminate the toxic flue gases from the wash area. Waste-water was gravity fed to a small holding tank containing an automatic pump, and water was then pumped to a large frametank outside the building for later disposal.

For this response, with very low numbers of birds, this set-up was adequate, although limitations were identified. The frames were found to be very heavy and difficult to move around. In addition, the gas califonts were mounted such that the hot flue gases from the heater units were discharged in a manner that resulted in the potential to cause burn injuries to personnel.

From this point, we started working on the designs for containerised wash unit.

Design of Mobile Containerised Unit

To meet the needs of an oiled wildlife response capability in a variety of configurations at remote sites, an ISO 20 foot-shipping container, donated by Hamburg Sud, was converted into a portable bird cleaning room in 2002. During the design process, some of the more elaborate versions were eliminated due to funding limitations, and the final design proved a cost-effective and very workable model.

In the case of a spill affecting small numbers of birds, this mobile wash unit is designed to enable both washing and rinsing of oiled birds. In a larger spill response with significant numbers of birds, it would be more effective to utilise the container for the rinse stage only to enable a clear demarcation between clean and dirty birds. In this situation, the container would be connected to an adjacent building which is set up as a wash station, and cleaned birds would be moved through into the container for the rinse process only. The configuration of the container has the ability to run up to three cleaning stations, and there is water capacity to run an additional four wash stations in an adjacent building or marquee at the same time. The container has been designed with an additional door and window immediately inside the external container door to allow for the container to open directly into a large tent or marquee setup adjacent. The container serves as a supply of power, lighting and water to the tent, as well as providing an air extraction unit. In

addition, the internal doors allow can be left open allowing easy access when in use, but when these doors are closed they are secure and immediately ready for transportation.

A compartment at one end of the container serves as a separate plant room housing an extract system, on-demand water heaters, water softener and pump, and carries external connections for water, bottled gas and electrical supply. This separate area serves to minimise noise, protect the equipment from the washing area when it is hosed down, and additionally helps keep unauthorised people from access to the plant room.

An extract system has a fresh air inlet grill under the window at the front of the container to allow fresh air in. A duct running across the top of the container with adjustable air dampers acts to extract fumes, heat and steam. This duct extends into the plant room, dropping to floor level via two 90^0 bends, where a horizontally mounted fan sits which discharges air to the outside of the container. By offsetting the fan from the duct, there is a drop in the fan noise audible in the wash area by containing the noise within the plant room.

Power to the container can be supplied from an adjacent generator or power outlet from a nearby building. Conveniently, an external caravan-type plug and lead allows the container to plugged into any single-phase caravan power outlet. The electrical system within the container has water resistant switches, power outlets and a lighting system, including separately switched bulkhead lights above the front entrance and internal fluorescent lights with waterproof casings. Electricity supply is controlled by a separate switchboard in the plant room and every component is residual current device (RCD) protected for safety.

Water heating is supplied by are three Rinnai Infinity 24™ on-demand gas califonts that are electronically controlled by dialing up the required temperature. The califonts are staged so that as the water draw off the first unit increases, the second one fires up, then the third if required. In situations with where there is a low-pressure water supply, or if draw is required from a water storage container such as a frame tank, a water pressure pump serves to boost water. This pump is rubber mounted on steel brackets in the plant room of the container.

The choice of water pipes system for water reticulation from the gas califonts was made very carefully. Our experience with moving shipping containers has shown that they flex significantly during loading and transportation, and fixation of this pipe to the container was required to be robust and stable during transportation and use. The system that we found to be most effective was Fusiotherm® (produced by Aquatherm), a fusion welded polypropylene product. Steel brackets were welded to the container walls to accommodate the sliding clamp system that Fusiotherm® utilises. This system allows the pipe-work to be held tight, while allowing some flexibility. Gas is supplied via two or more large LPG (liquid petroleum gas) bottles attached to the outside of the container. These have an auto-change regulator allowing a rapid change between bottles. We found that the immediate start and instantaneous water heating achieved with LPG units made using gas far superior over electricity. This eliminates delays associated with electrical heating of a hot water cylinder. In addition, hot water supply is endless so long as there is an LPG supply. LPG refill stations are readily available throughout New Zealand.

An Aquasoft 75 Commander® automatic water softener and brine tank is fitted alongside the water pump in the plant room for use in situations where the available water is harder than ideal for washing. The valve system allows multiple changes of water flow direction, allowing inclusion of the water pump or softening system as required. Water is tested on-site using a water-test kit, and water is softened accordingly.

It is well known that soft water should be used to achieve optimal results when washing oiled birds The use of 'hard water' during the wash process results in deposits of conjugated detergent particles and calcium carbonate particles on feathers, potentially extending the length of time it will take for individual birds to regain waterproofing (NZWHC SOP, 2009). In addition, the presence of calcium and magnesium can result in hard deposits in the heat exchangers of the gas califonts, eventually blocking of the pipes over time thus restricting water flow. This makes water heaters inefficient and this can in turn destroy the heat exchanger. Hard water can also cause galvanic corrosion, the result of contact of two different metals, with one metal eating the other away.

The container flooring consists of a non-slip Tarkett™ membrane for the ease of cleaning and for personnel safety. The floor consists of a suspended plywood base and is designed to slope from the outside edges of the container to the centre where a waste channel is fitted. The waste channel runs the length of the container and plant room, discharging into a small holding tank outside the rear of the container. A wastewater pump is run from an external power outlet mounted on the outside of the container, pumping wastewater into a frametank ready for disposal.

On-going maintenance costs for the container have been minimal to date. Recently, modification of the water system has been undertaken to increase versatility of the hot water system. An additional water outlet has been added to the outside of the container, connecting to the hot water outlets within the plantroom. This allows an external supply of hot water to an adjacent external building or tent that can be set to a different temperature and flow rate to those in use within the wash container.

Container deployment

The use of shipping containers as a relocateable wildlife cleaning unit allows a response effort in a variety of configurations at remote sites. Road, rail, ferry and even air transport, via military Lockheed C-130 Hercules aircraft, permits movement of the containers anywhere in New Zealand within 12 to 36 hours. A supplier agreement is in place with a local road transportation company for a 24/7 mobilisation capability within the North, South and Stewart Islands. If landing permits, use of a C-130 Hercules can transport the units to remote island locations. It is policy that a member of DWYERtech Services must accompany the container to enable correct assemblage on-site. Most importantly, the container needs to be set level to allow the drainage system to function effectively.

Set-up of the container from the time of its arrival can be as little as 30 minutes, depending on the configuration of nearby buildings, as well as the associated terrain. Once the gas bottles are connected, enabling the hot water reticulation and power supply, and the waste outlet is hooked over a frame tank, the system is ready to function.

On-going Usage of the Container:

Currently, the container is used as the main source of hot water for the NZWHC Annexe, a pre-existing scaleable oiled bird response facility at Massey University (Morgan et al 2009). To date, this has been utilised in this situation for training purposes. Regular use helps ensure equipment is maintained and ready for deployment when required.

In 2006, the container was mobilised for a national (Tier 3) oil spill response exercise led by Maritime New Zealand (MNZ), the government agency responsible for dealing with maritime oil spills in New Zealand. During "Exercise Hardrock" the container was mobilised from Palmerston North to Picton, a port at the top of the South Island. The container was transported by road, then interisland ferry, arriving in Picton six hours after deployment. DWYERTech staff flew to the site, arriving several hours before the container, and prepared the predetermined site for the container's arrival. This included arranging the water, power, and wastewater systems. On arrival, the container was lowered and leveled on site, the water, power and waste connections were installed, and the system was functional within 30 minutes of arrival.

Conclusion

Evolution of a mobile washing system for oiled wildlife response in New Zealand has come a significant way since 1998. We feel that our containerised unit is comparable with other similar models in place around the world. The added advantage of our model is the relatively low cost of production. The original cost of this unit to the NZWHC around $40,000 NZD (approximately 20,000 Euros). In today's economy, we estimate that this would cost approximately 40,000 Euros to build an identical model from scratch. Since the construction of the containerised wash unit, we have not had an oil spill response in New Zealand requiring a wildlife reponse. For this reason, the container has not been trialed in an actual spill response scenario. We are continually looking to improve the standards and equipment that we use, and there is no doubt that we will continue to make minor improvements along the way to improve the functionality of the system.

In the future we are looking to build a second containerised wash unit which will stored at Christchurch. This would enable a quicker response time for the South Island, while allowing a double up of wash units if more were required at a large spill. In addition, weather disruptions to the interisland ferry will not impact on the mobilisation timeframe.

The ease of transportation and set-up of this system allows a very versatile, efficient and cost effective way to mobilise an Oiled Wildlife Response appropriate for the New Zealand setting.

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