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Bulk Windshield Washer Fluid Update


As many of you already know, there has been a lot of attention paid to the storage and handling of bulk Windshield Washer Fluid (WWF) in the last few years. This is to provide an update on the current status of WWF with respect to the National Fire Code, as well as some background information on the topic.

Background Information:

Windshield Washer Fluid (WWF) has been handled in bulk for over 20 years with the estimated number of installations in Western Canada between 700 and 3000. Across Canada, we estimate the bulk WWF business delivers in the range of 50,000,000 litres annually. For the purposes of this update we are considering WWF to be a mixture of approximately 50% water and 50% methanol, giving it a -40 °C freeze point. It should be noted that there are Bug-Wash mixtures for the summer that are essentially soap and water and are not affected.



Fire Codes rate the risk of Flammable and Combustible Liquids based on their Flash Point, with the lower the flash point being the highest risk. For example, the vapours coming off a liquid with a flash point of 10 °C will “flash” if the temperature is higher than 10 °C and there is oxygen and a spark. On this basis, WWF is considered to be a Class 1 Flammable Liquid because it has a flash point of 28 °C. This is the same risk category as straight Methanol or Gasoline. Significantly, the codes do not consider other factors such as Fire Point, Heat of Combustion or whether the liquid is 50% water or not.

Validated on Apr. 05 2011		Premium Washer Fluid and De-Icer -45°C			Page: 5/8
Vapor pressure	<12.8 kPa (<96 mm Hg)	Viscosity	Not available.		
Vapour Density	<1.11 [Air = 1]	Solubility	Soluble in water.		
VOC content	Not available.	Other Properties	Not available.		
The product is:		May be combustible at high temperature.			
Auto-ignition temperature		385°C (725°F)			
Flash point		Closed cup: 28°C (82.4°F) [Tagliabue.]			
Flammable limits		Lower: 6% Upper: 36%			
Fire hazards in the presence of various substances		Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat. Non-flammable in the presence of the following materials or conditions: shocks and mechanical impacts. Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes.			

For perspective, Diesel is a “Class II Combustible” since its flash point is between 38 °C and 60 °C. Used Oil is considered to be a Class III Combustible since it is deemed to have a flash point between 60 °C and 93 °C. Lube Oils such as 10W30 or ATF are unrated since their Flash Point is well over 93 °C. The National Fire Code of Canada and other provincial Fire Codes have similar or identical classifications. The reason that WWF can be handled in service stations and hardware stores is that Section 4.2 essentially has an

exemption that allows “50% Water-Miscible Flammable liquids” to be stored and handled in “closed containers not larger than 5 litres”.

Recent History

Fireball Equipment’s business is designing and supplying lubrication systems for all types of maintenance shops in Western Canada. This often includes WWF along with all the oils, grease, used oil evacuation and compressed air systems. In October 2012 an Edmonton Fire Inspector required a change to an installation we had completed for a large municipal maintenance shop. On behalf of our customers, we submitted a formal Code Change Request to the Alberta Safety Services for clarification on how bulk WWF can be handled in order to be in compliance with the Fire Code. In response, Alberta Safety Codes issued a Fire Code Safety Alert in November regarding the Storage of Windshield Washer Anti-Freeze, essentially reinforcing that it be handled as a Class 1 Flammable Liquid as per the Code.

Since the issuance of the Fire Code Safety Alert, there has been a significant amount of concern and disruption in the industry regarding how bulk WWF can be handled to stay within compliance. After discussions with various enforcement officials, the recommendation was to get the issue addressed at the National Fire Code level.

National Research Council and the National Fire Code

The National Research Council is responsible for National Safety Codes and has the resources to investigate the options and provide a solution. The Standing Committee on Hazardous Materials and Activities is responsible for the National Fire Code, which the provinces either use directly or model their codes after. They are a very capable group with members from across Canada and from a variety of backgrounds. Some provinces (Saskatchewan and Manitoba) adopt the National Fire Code directly while Alberta and BC have their own Fire Codes modelled very closely after the National Fire Code in order to provide consistent rules across the country.

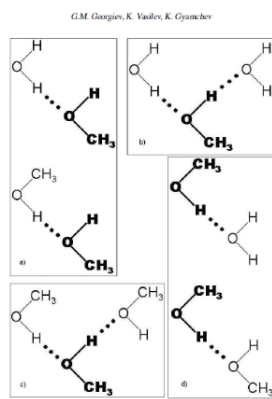


Figure 2: Hydrogen bonds of a methanol molecule (bold) with its neighboring molecules.

The opinion was that, if the National Fire Code resolves the issue, Alberta and BC will likely adopt the same rules. In fact, the Provinces can make changes on very short notice by issuing a STANDATA so their changes can be done before the next edition of the National Fire Code is officially issued.

In preparation for the Code Change Request, we researched the bulk WWF issue in order to provide accurate supporting information. We found that there is a great deal of information available about the properties and safe handling of methanol but very little available on WWF. At our expense, we contracted with Alberta Innovates (formerly Alberta Research Council) to analyze WWF and provide better information upon which to evaluate the risk. For example, we found out that the “Net Heat of Combustion” of WWF is 6.37 MJ/kg compared to 22.7 for Methanol and 44 for Gasoline. Part of the reason for this is that WWF is a “polar liquid” so the water tends to bond the methanol molecules and minimize evaporation.

Safety Incidents



We researched whether there have been safety incidents from the use of bulk WWF. There was a reported injury in Kelowna where a young worker used a plasma cutter to remove the lid of a “WWF” drum. We made a Freedom of Information Request to WorkSafe BC and found that it was WWF Concentrate, not WWF. WWF Concentrate is essentially straight methanol but is often advertised as WWF Concentrate. There was a non-injury incident in a Calgary car dealership where a methanol spill created an explosion and fire. Outside of this industry, serious methanol fires and explosions are relatively common. One of the risks is that methanol burns with an invisible clear flame. Think “Talladega Nights: The Ballad of Ricky Bobby” where Ricky Bobby is running around the race track yelling “I’m on fire, I’m on fire”. A methanol flame is invisible so he didn’t know if he was on fire or not.

6.1 Fire Detection and Protection

Broadly speaking, all fires have a common trait: they begin small and grow larger. The objectives of fire protection are to contain, control, and extinguish fires while they are still small. Success is best achieved using three aspects of fire response: (1) early detection, (2) immediate response, and (3) appropriate action.

All fires release heat, and most fuel fires display flames and generate smoke. Fires involving pure (neat) methanol are not like most commonly encountered fires. Methanol fires produce less heat (have a low flame temperature); transfer less heat to surroundings (flames are non-luminous); are difficult to see (flames are nearly invisible to the naked eye during daytime, and there is little or no smoke); can initiate under unexpected circumstances (flammability limits are between 6 vol% and 36 vol% in air); are difficult to extinguish with water (100% miscible); and are flammable to 75 vol% water.

Early detection of methanol fires requires different technology from early detection of gasoline and diesel fires. If methanol ignition occurs in daylight hours, it is unlikely that the fire will be detected visually until it spreads to adjacent materials that emit a luminous flame or a visible plume of smoke. Two instrumentation technologies are available for early detection of a methanol fire. The first is vapor detection. If a methanol source is emitting large quantities of vapor, it is only a matter of time before ignition and flashback occurs. With luck, the source of

To date, we have not found any safety incidents involving premixed WWF, in spite of the number of bulk installations in operation. This includes the millions of everyday usages of packaged WWF purchased at retail outlets and installed by vehicle operators. If anyone is aware of any incidents, please let me know.

Code Change Request




Table 1: Analytical Properties of WWF and its Comparison with Pure Methanol

Property	WWF (F113 0356)	Methanol (Reference) ^a	Units
Density @ 10°C	0.9396	0.8000	g/mL
Density @ 15°C	0.9371	0.7960	g/mL
Density @ 20°C	0.9341	0.7910	g/mL
Density @ 25°C	0.9310	0.7880	g/mL
Density @ 35°C	0.9241	0.7790	g/mL
Absolute Vapor Pressure @ 37.8°C	30.3	32.0	kPa
Flash Point, (closed cup)	30.0	15.5	°C
Water Content	64.2	0.02	Mass %
Methanol Content	35.8	99.08	Mass %
Hydrogen (H) content	11.71	12.58	Mass %
Net Heat of Combustion	6.4	19.9	MJ/kg
Gross Heat of Combustion	8.9	22.7	MJ/kg
Electrical Conductivity	169.9	>150 ^b	µS/cm

In March 2013, we submitted a formal Code Change Request to the National Research Council Standing Committee on Hazardous Materials and Activities. The Change Request was supported with the Alberta Innovates laboratory analysis and with research that we had done regarding the volumes of bulk WWF used across Canada, how it is typically handled and research on any safety incidents. The supporting package for the NRC meeting was 90 pages long.

I attended the April 17-18, 2013 meeting to answer questions regarding how WWF is currently being handled and provide background on the issue. After a thorough discussion of the gap between the practice in the field and the Fire Codes, the NRC Standing Committee decided to form a Task Group to investigate and bring a recommendation back for approval and inclusion in the 2015 Edition of the National Fire Code. The Task Group will be comprised of Standing Committee members across Canada as well as a selection of outside stakeholders, including myself.

Task Group on WWF

The focus of the Task Group is to make recommendations to close the significant gap between how bulk WWF is handled in the field and how it is treated in the National Fire Code of Canada. The Standing Committee may decide to open the issue to public comment and, once adopted, these recommendations will be incorporated into the next edition of the National Fire Code. It is expected that those Provinces that have their own Fire Codes, such as Alberta and BC, will likely adopt it as soon as the NFC direction is clear.

As I see it, the Task Group may recommend;

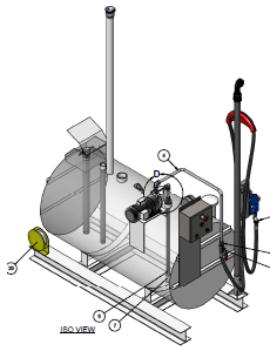
1. To amend the Code to match the field practice and effectively take it out of the scope of the code
2. That the existing Fire Code treatment is appropriate and make the field practice meet current code requirements through enforcement
3. To meet somewhere in the middle with a solution that keeps it within the scope of the code but alters the requirements somewhat to suit the fluid risk and applications



I would not hazard a guess as to what the final recommendation will be.

From one standpoint, it was a successful meeting as the problem has been recognized nationally and a process to resolve it has been started. On the other hand, it looks like it will be a while before we have a resolution. The National Fire Code is updated every 5 years. The focus of the Standing Committee in 2013 was to get the 2015 changes approved and in place. The Task Group was set up and had its first two meetings in April and June, 2017. These were 2 hour teleconferences. At this point, the group is shooting for a resolution by April 2018. Then, after public review and feedback, it would be included in the 2020 National Fire Code. I have doubts that this schedule will be met. Part of the reason is the Task Group on Water-Miscible Flammable Liquids is responsible for all water-miscible liquids, including liquor distilleries. This scope is much more broad than simply evaluating the risk around windshield washer fluid.

What your options are



The local Authority Having Jurisdiction, typically your local Fire Inspector, needs to be consulted. The treatment of WWF by the authorities varies widely across jurisdictions. We have completed installations using certified, double-wall stainless steel tanks, stored outside. We have also done installations using the traditional poly tanks for customers that are using non-flammable bug-wash in the summer months. Some inspectors are allowing 205 litre drums of premixed WWF stored inside the building. There is a wide variation across Canada regarding how bulk WWF is handled.

If you have existing equipment and decide to change the equipment usage, please contact us to ensure the pumps, connect hoses, distribution lines, hose reels and dispense valves are correct. For example, our WWF installations use stainless steel tubing that would be usable for oils. If a low-pressure hose is used, it can be used for coolant, air or water but not oil.

What we would not recommend

I would NOT RECOMMEND storing and dispensing “WWF Concentrate” in your building, whether or not it is an “approved” system. WWF Concentrate is essentially straight methanol and, in my opinion, presents a much higher risk than pre-mixed 50/50 WWF. These systems typically mix the methanol with water as it is dispensed, or it is mixed in a tank on your premise. I believe there is a significant risk of having drums of methanol in your shop, including the risk involved with the spare full drums and the risk of disposal of the empty drums. We are Certified Petroleum Contractors qualified to install fuel tanks, and we will not install or service any system that includes methanol storage inside a building.



My Personal Opinion

My personal feeling is that treating WWF as a flammable liquid creates much higher cost for the dealerships, creates a lot of plastic waste from the jugs and affects your shop efficiency. I believe that the safety risks involved in handling methanol in drums is significant, making the cure worse than the disease. Please be clear that I have no authority whatsoever and your local Authority Having Jurisdiction has the final say.

Summary

WWF is classified as Flammable Liquid by the Alberta Fire Code, the BC Fire Code and the National Fire Code (SK and MB). The National Research Council Standing Committee on Hazardous Materials and Activities has a Task Group to deal with the gap between how WWF is being handled in the field and how the codes handle it. The Standing Committee will make changes, if necessary, to the National Fire Code but it will likely be into 2019 before there is a resolution. Meanwhile, follow the instructions of your local Authority Having Jurisdiction.

I hope that this helps you understand what has transpired so far and where it stands now. I will continue to attend the Task Group meetings and work towards a safe and practical solution. Meanwhile, please feel free to contact me by email or phone if I can be of assistance to you.

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