

Thermo-Gel[®]

The Solution for Fire Professionals.[™]

Aviation Mixing and Application Guide



US Forest Service Approved
Class A Fire Retardant/Suppressant Gel

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1.0 Introduction

Thermo Technologies, LLC is leading the way in the development of new and innovative products to combat the devastating loss of life and property brought annually from fires.

We have worked with super absorbent polymers and their use within the fire service community for over 10 years and recently we have introduced a revolutionary product trade-named Thermo-Gel[®]. This new product will revolutionize how fires are fought in all countries. Thermo-Gel[®] is not only superior in performance to traditional products, it is also much more cost effective and easier to transport and deliver to any style of firefighting aircraft.

Customer service is the priority, and the company strives to fulfill all customer requests quickly and professionally. Each year a new customer service standard is set within the fire industry allowing our business to grow at a rapid pace. Our well trained and technical staff help to ensure that each customer is provided the service they have come to expect on a daily basis.

Innovative products are accompanied by consistent adaptation to customer requirements and an active company philosophy. Thermo Technologies is a place, “Where problems become solutions[™]”.





2.0 Marsh Funnel & Cup

Use of the Marsh Funnel and Cup is crucial for the proper testing of your mixed, water enhanced product. A viscosity test should be performed immediately after initial setup as this will determine your baseline for proper mixture and application of product. Whether batch mixing or using the FireDos[®] equipment this step must be performed to assure accurate mixtures.

Please see the instructions below on proper use and testing using the Marsh Funnel & Cup:

1. Close the funnel tip with a finger and pour the Thermo-Gel[®] mixture into a clean, dry upright funnel until the fluid level exactly reaches the bottom of the screen (the line near the top on the inside of the funnel).
2. Measure the time in seconds for exactly one quart (946 ml) of Thermo-Gel[®] 200L to flow out of the funnel (to the line in the Marsh cup).
3. Refer to the chart below and match the Marsh funnel time to determine the mixture ratio and viscosity type. **An ideal starting point is a 19-23 second marsh funnel time.**

NOTE: The mixture ratio provided will apply only to gel at the time at which the sample is tested. The chart below was reflects tests with potable city water. Mixture ratios to get a Marsh Funnel time in the chart may differ depending on the ionic concentration of the water being tested.

Modified Marsh Funnel Flow Times (no tip)		
Mixture Ratio	Viscosity Type	Marsh Funnel Time (sec)
1.3% - 1.4%	Low	15-19
1.5% - 1.6%	Medium	20-29
1.7% - 1.8%	High	30-39



2.1 Recommended Gel Applications

After determining your viscosity range listed on the on the previous page you can then make an assessment as to the proper mixture. Because there are many variables in aviation applications, including winds speed & direction, fuel types and humidity among others.

See below for recommended applications:

Time (sec)	Viscosity Range (cP)	Mixture Type	Properties of Solution
19-23	750-1300	Baseline	<ul style="list-style-type: none">• Recommended viscosity range for direct suppression or near direct attack• Ideal mixture for the penetration of all fuels while exhibiting slight adhesion characteristics
24-27	1301-2300	Baseline Plus	<ul style="list-style-type: none">• Recommended viscosity range for use in windy conditions• Exhibits less drift than Baseline• Will not penetrate as well as Baseline• Useful in suppressing crown fires

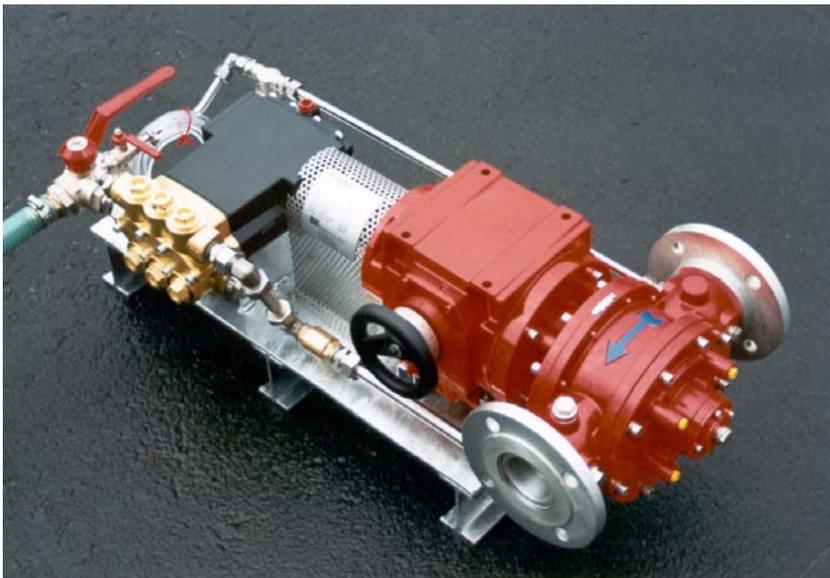
3.0 FireDos[®] Operations

Use of the FireDos[®] unit for mixing gel and dye are covered in the supplied operations manual.

Note your recommended viscosity range to provide the correct mixed gel percentage setting of the FireDos[®].

Colorant is to be mixed at a fixed percentage of 0.4% setting on the FireDos[®].

Review the operations manual thoroughly before operating the unit. Also note the recommended service requirements as well.





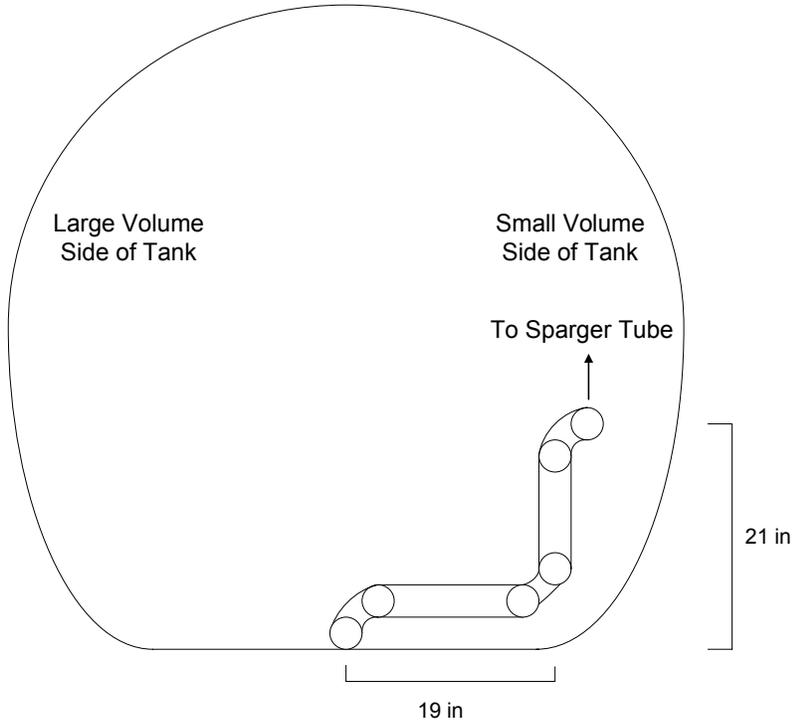
4.0 Batch Mixing

Thermo-Gel[®] and colorant can be effectively mixed and applied through batch mixing applications using a simple tank that utilizes a sparger tube. While this requires additional time to mix it will provide a consistent and effective mixture.

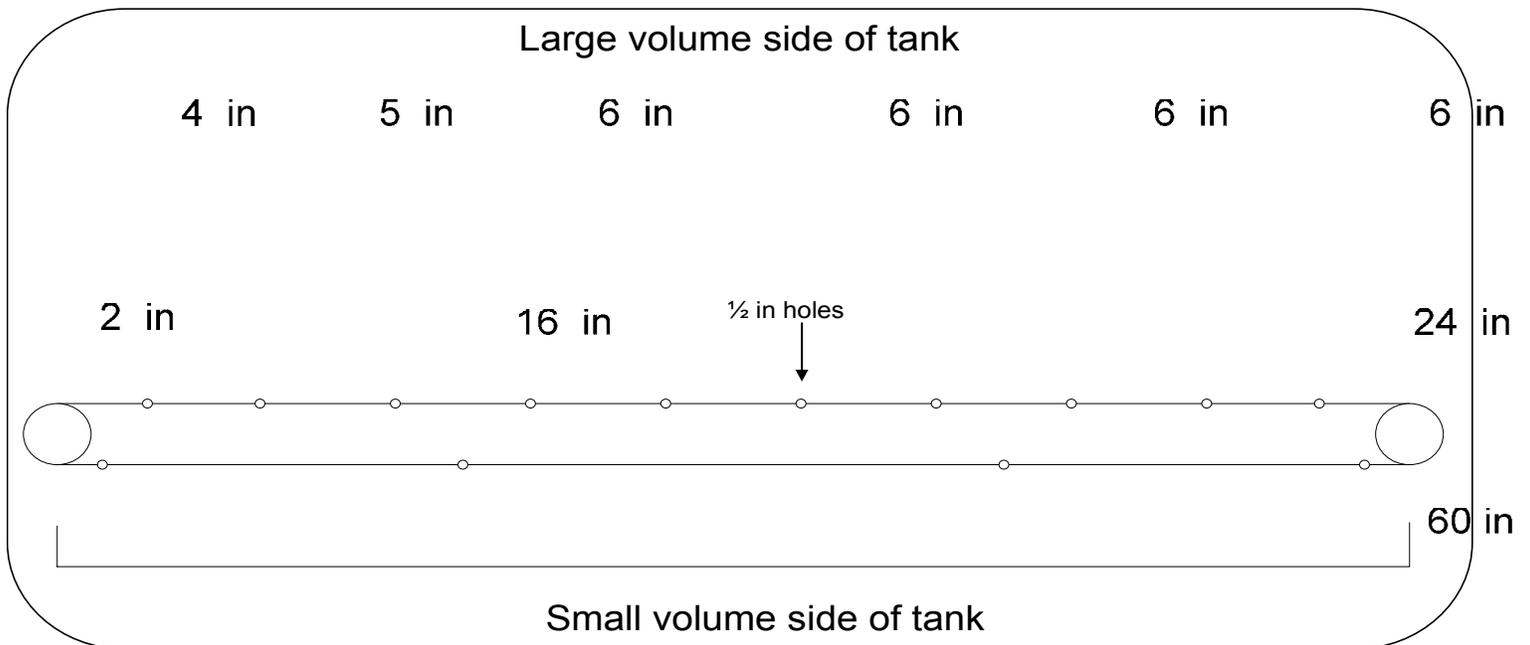
See instructions and guides listed on the following pages.

4.1 Sparger Tube Installation Schematics

B1: Tubing to Sparger



B2: Sparger Tube





4.2 Batch Mixing Instructions

1. If no sparger tube is present, modify the existing system with PVC tubing as shown in or similar in design to the schematics (page 9). Sparger tubes may be run vertically if necessary. Drill the holes approximately 45 degrees from the bottom most point along the tube.
2. Add required amount of water to the mix tank and the required amount of dye, which is one water soluble bag for every 400 gallons of water (page 11). The food grade colorant is easily mixed into solution, small clumps should not affect the overall mixture.
3. Begin recirculating the water and dye mixture and then add the required amount of Thermo-Gel[®] as determined by the mix ratio percentage (page 10). Screw the cap back onto the Thermo-Gel[®] 200L containers and place in a contained area that will minimize trip hazards. Avoid spilling concentrate on asphalt.
5. Recirculate the tank for a minimum of three minutes.
6. Check the water-Thermo-Gel[®] mixture for consistency. Clumps will be easily recognized by their deeper or brighter color. If clumps are present they can be removed by increasing the recirculation time. Measure and record the marsh funnel time as often as is required (page 4).
7. Thermo-Gel[®] can be easily washed off of most surfaces. If the solution has completely dried then a mist of water should be used over the entire surface in order to reactivate the Thermo-Gel[®]. Allow absorption to occur for a minimum of 1 – 2 minutes and then wash off the residual product with a straight stream of water. Both the dye and Thermo-Gel[®] are biodegradable and ultraviolet light degradable.
8. For a troubleshooting guide please refer to page 12.
9. For other safe handling and disposal methods refer to the MSDS for Thermo-Gel[®] blue dye, and red dye found with your shipment of product.



4.3 Thermo-Gel[®] Mix Ratios

See the mix ratio charts listed below for proper batch mixing:

SEAT Load Volume							
	400 (gal)	500 (gal)	600 (gal)	700 (gal)	800 (gal)	900 (gal)	1000 (gal)
Mix Ratio							
1.00%	4.0	5.0	6.0	7.0	8.0	9.0	10.0
1.10%	4.4	5.5	6.6	7.7	8.8	9.9	11.0
1.20%	4.8	6.0	7.2	8.4	9.6	10.8	12.0
1.30%	5.2	6.5	7.8	9.1	10.4	11.7	13.0
1.40%	5.6	7.0	8.4	9.8	11.2	12.6	14.0
1.50%	6.0	7.5	9.0	10.5	12.0	13.5	15.0
1.60%	6.4	8.0	9.6	11.2	12.8	14.4	16.0
1.70%	6.8	8.5	10.2	11.9	13.6	15.3	17.0
1.80%	7.2	9.0	10.8	12.6	14.4	16.2	18.0
1.90%	7.6	9.5	11.4	13.3	15.2	17.1	19.0
2.00%	8.0	10.0	12.0	14.0	16.0	18.0	20.0



4.4 Dye Mix Ratios

All of our colorants have Food and Drug Administrative approvals and are environmentally compatible. The colorants are fugitive and will begin fading within 48 hours of application.

See below for recommended applications:

1. In FireDos[®] applications set the percentage to .4%. For instructions on setting the percentage please see your FireDos[®] operations manual.
2. In batch mixing applications it is recommended to use (1) water soluble bag of colorant for every 400 gallons of water.

See chart below:

Water (Gal)	Soluble bags
0-400	1
401-800	2
801-1200	3
1201-1600	4
1601-2000	5



5.0 Troubleshooting

Problem: I do not get the correct consistency of mixed Thermo-Gel[®] when mixing Thermo-Gel[®] after a load of long-term retardant or foam.

Solution: Make sure to thoroughly rinse the tank and hoses when utilizing Thermo-Gel[®] after a load of long-term retardant or foam. The products cancel each other out when mixed, resulting in basically water.

Problem: It takes a long time to fill the aircraft with Thermo-Gel[®].

Solution: Make sure you are using a 3" fill hose.

Solution: Make sure you are adding the correct amount of concentrate to achieve the desired mixture. Check by doing a marsh funnel test. If you find you are at a high concentration reduce by adding x amount of water and re-circulate for 15 to 20 minutes.

Solution: An 11 HP pump or higher is recommended.

Problem: I have a thick sludge of Thermo-Gel[®] at the bottom of my batch mix tank.

Solution: Refer to mixing instructions, do everything in the precise order and make sure to shake the 5 gallon jugs before pouring into the dyed water that is re-circulating.

Solution: Allow additional time to re-circulate in the future mixtures if possible.

Solution: First, add water to the batch mix tank and re-circulate.

Solution: Use a heavy garden rake to break up the product while re-circulating.

Problem: I have had a load ready to go in my mix tank for a week and there has been no fire activity and the Thermo-Gel[®] mixture has become thick.

Solution: Keep the mix tank sealed as much as possible to reduce evaporation.

Solution: Add water and re-circulate for 15 to 20 minutes. Repeat if necessary.

Problem: The water dissolvable dye bags are not dissolving.

Solution: Make sure to throw the dye bags in with some force when you first start adding water into the mix tank. The force from the water passing through the Spurger tube will dissolve the bags.

Solution: Although unnecessary in most cases cut the dye bag open and empty the powdered dye into the mixing tank while water is filling.



5.0 Contact Information

Corporate Contact Information:

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