USDA FOREST SERVICE

EQUIPMENT DEVELOPMENT CENTER, SAN DIMAS, CALIFORNIA

Project Record

7120 (5100)

August 31, 1965

REQUIREMENTS FOR A CHEMICAL SLIP-ON EXTINGUISHER FOR FOREST PATROL VEHICLES

(ED&T-1509)

GENERAL

Small quantities of water in vehicle tank systems are proving useful in extinguishing small fires in grass, brush, or trees. Availability of water and its general capability for firefighting has long been established.

NEED

The U. S. Department of Agriculture, Forest Service, maintains a specification for a 50-gallon Patrol Slip-on Tanker. This unit has proven to be one of the most heavily used tankers in the 50- to 300-gallon slip-on series.

The 1964 Regional Survey states that one third of the slip-on tankers fell into the 50-gallon class. Two West Coast Regions have over 100 units each in use. Heavy orders are anticipated during the next five years. Some of this need may be met by a pressurized extinguisher designed for patrol pickup use. Such units must be placed in operation quickly by personnel not directly related to fire suppression work.

DESCRIPTION

The proposed system could consist of a nominal 33-gallon pressure vessel, a relief valve, the gas expellant device, regulator, indicator valve, basket or reel, hose and nozzle. The extinguisher will be capable of delivering an effective nozzle stream through 200 feet of light hose up a 50-foot vertical lift. Plain water, or a chemical solution, will be used. No moving mechanical parts will be employed. The 42-pound gasoline engine-driven pumper in the present assembly will be replaced

with a positive, fool-proof pressure system which will eliminate the use of petroleum fuels altogether. The unit will have easy loading and tie-down features.

DETAILS

EXTINGUISHANT .....Plain Water
Wet Water
Antifreeze Solution
Pyro Solution (see appendixes #2 & 3).

PRESSURE VESSEL

MATERIALS.....Stainless Steel or Fiberglass (see appendixes #4 & 5).

CAPACITY.....33-gallons (nominal) - will discharge a minimum of 30 gallons at the nozzle.

FILLER OPENING.....Minimum Opening 4-inch ID with Safety Opening Features as required.

DISCHARGE CONNECTION.....3/4-inch Garden Hose Threads (3/4"-11 1/2-NH).

PRESSURE VALVE.....Provide Valve Opening so vessel can be pressurized with ordinary air from any compressor unit as an alternative system.

RELIEF VALVES, PRESSURE GAUGES, AND OTHER ITEMS...As required by Good Safety Practice — also provide a discharge valve to block release of expellant gas after extinguishant is used.

GAS EXPELLANT SYSTEM

GAS.....Inert Type - inexpensive and available locally, such as nitrogen or equal.

CYLINDER.....Commercially available - shall be capable of discharging two 30-gallon loads at free air temperatures ranging from 60 to 120 degrees F (up to 8-hour exposure periods).

CONNECTIONS.....Standard to Industry and shall provide for quick cylinder replacements not to exceed 5 minutes of fireman's time.

PERFORMANCE.....Minimum of 12 gpm at 150 psi measured with plain water at the vessel discharge connection - environmental air temperatures will vary from 60 to 120 degrees F (up to 8-hour exposure periods).

USE RATE.....Intermittent to continuous discharge.

ACCESSORIES

HOSE.....200 feet of chemically resistant hard rubber hose; 3/4" knurled garden hose coupling with 3/4" threads (3/4"-11 1/2 NH; 5/8-inch ID suggested.

NOZZLE.....Adjustable with shutoff, straight stream and spray positions; flows to 12 gpm.

REEL OR BASKET.....Lightweight construction to handle working pressures up to 300 psi; will hold 200 feet of hose; if basket used, include a duckboard.

CONFIGURATION - WEIGHT

DIMENSION.....The entire assembly, exclusive of hose reel or basket, will not exceed a 47 by 47-inch base nor a 22-inch height.

WEIGHT.....Dry weight of extinguisher with a charged cylinder will not exceed 350 pounds, including hose and accessories.

CONTROLS.....The operating position is established on the driver's side just behind the cab; all valves shall be within arm's reach of a man standing on the ground; all gauges shall face this operating position.

LOADING.....Arrange as skid-mount base; provide two small wheels at front of base to facilitate pickup loading; these wheels should be retractable when unit is in service; quick tie-down features will be provided.

A. V. Shoemaker

A. V. Shoemaker, Project Leader

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U. S. FOREST SERVICE
Atlanta 23, Georgia

FIRE RETARDANT

11-37-0 Liquid fertilizer: Is now available through the Tennessee Valley Authority, Wilson Dam, Sheffield, Alabama. Telephone area code - 305 - 383-4631.

Formula (approximate)

49% Ammonium pyrophosphates

28% Orthophosphates (about 1/2 and 1/2 monoammonium phosphate and diammonium phosphate).

17% Tripolyphosphates

6% other (mainly tetrapolyphosphates)

Mixing: One gallon of 11-37-0 concentrate to 5 gallons of water will give the desired 8% - P_2O_5 recommended by the Southern Forest Fire Laboratory. The concentrate weighs 11.7 pounds per gallon, while the final solution weighs 8.9 pounds per gallon. Concentrate mixes readily with water and requires little agitation other than that furnished by pumping.

Mixer: Not required.

Visibility: The drop pattern is not visible on the ground from the air without the addition of a coloring agent. Orange pigment is effective in coloring for visibility. Cost for coloring approximately $0.07 per gallon of final solution. Cheaper dyes are not effective without the addition of thickening agents. The Tennessee Valley Authority and the Southern Forest Fire Laboratory are continuing research on coloring agents.

Corrosivity: 11-37-0 is a neutral solution and as such does not release free ammonia. Though the solution is not as corrosive as straight DAP or MAP. Pending further tests, use of sodium dichromate is recommended as a corrosion inhibitor.

Storage: 11-37-0 may be stored indefinitely in mild steel drums or tanks. Corrosion rate of mild steel being only 1.9 mils per year.

The concentrate in storage will not settle out and will not freeze until subjected to very low temperatures.

Retardant Properties: 11-37-0 fertilizer has not been field tested as a retardant. However, the 5 to 1 mix will produce the 8% P_2O_5 proven effective in straight DAP solutions. 10-34-0 has been field tested and is an effective fire retardant. (10-34-0 and 11-37-0 are basically the same, the 11-37-0 being more concentrated.)

LIQUID PHOSPHATE CONCENTRATE, "Pyro" (11-37-0)

Supplement to Chapter III, CHEMICALS FOR FOREST FIRE FIGHTING, NFPA, 1963 (page 15, paragraph preceding Viscous DAP Combinations)

Chemical Composition. Concentrated liquid fertilizer, 49 percent ammonium phosphate, 28 percent orthophosphates (about half and half DAP and MAP), 17 percent tripoly-phosphates, and 6 percent other (mainly tetrapolyphosphates).

Description. A liquid concentrate that readily disperses in water. May be stored indefinitely in mild steel drums which do not have welded seams or tanks without corrosion problems. In storage it will not settle, and will not freeze until subjected to very low temperatures. The green concentrate does NOT impart color to the final solution of concentrate in water.

Mode of Action. The exact chemical reactions which occur when heat is applied to a phosphate coated cellulose fuel are not known. The Phosphate appears, however, to hinder the formation of volatile tars when cellulose is exposed to high heat, and to increase the charcoal fraction. It is an effective retardant on small volume fuels. It is not fully effective on large volume fuels such as large timber slash and large brush (roughly 10 feet or more in height). Thickened chemical solutions are needed for these larger fuel types.

Cost. Sixty-three dollars and fifty cents per ton (TVA price) or $.37 per gallon. One gallon of solution would contain 6.2 cents worth of concentrate. This price range applies within economic distance from TVA. However, the formula for this concentrate is available for use by commercial fertilizer manufacturers to meet demand outside reasonable shipping distance from TVA.

Mixing. No mixing tank needed. One gallon of concentrate in 5 gallons of water will give an 8.1 percent phosphate equivalent solution. Pump action is enough to get complete dissolution.

Desirable Characteristics:

a. No physical handling necessary for unthickened solutions.
b. No need to store pre-mixed solution.
c. Stable solution; does not "settle out."

Undesirable Characteristics:

a. Not easily colored.
b. Corrosive under some operating conditions.
c. High expense if mobile storage tankers need be purchased.
d. Not effective on larger fuel types.