

FIGHTING FIRES WITH LARGE
SPRAY STREAMS - PART 1
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The use of water spray in fighting fires has received considerable attention in the past few years. Much of the research and written material on this subject has been confined to a technical approach involving small fires. Very little effort has been made to evaluate the practical problems encountered in the use of spray streams on larger fires under various conditions.

The physical differences between spray streams and standard straight streams are: size of the water droplets, shape of the stream and effective reach. The theoretical factors mostly concerned with, the efficiency of extinguishment by water spray are: surrounding temperatures, physical conditions of the fire area, and size and energy of the water droplets. With these basic factors in mind research has indicated that there are several theoretical advantages and disadvantages in fire extinguishment by water spray streams

Advantages:

(1) Greater surface, area of the cooling medium is provided and exposed to the heated atmosphere.

(2) More efficient use and less water damage is possible due to a more complete transfer of heat to the cooling medium.

(3) Smaller water droplets can more rapidly be converted into vapor (steam), resulting in a reduction of the surrounding oxygen content. Complete conversion requires a considerable amount of heat.

NOTE: Water expands into steam at a ratio of 1 to 1700 with 1 gallon of water capable of producing about 227 cubic feet of vapor. Also, 1 gallon of water absorbs 9330 BTU in changing to steam, with only 1250 of these BTU's being utilized in raising the water temperature from 62° to 212° F.

(4) Spray streams can be used more advantageously in shielding personnel from radiant heat, and can make an area more tenable where heat and smoke constitute a serious hindrance to fire fighting.

(5) Greater coverage of an area can be obtained with less nozzle movement, due to wider angle stream shapes.

(6) Hand lines can be more easily managed using higher nozzle pressures and delivering more GPM. This depends on type of spray nozzle.

(7) Spray streams can be used more advantageously and effectively on some flammable liquid fires and electrical fires. Precautions may be necessary on flammable liquid fires due to increased amount of entrained air.

Disadvantages:

- (1) There is considerably less reach due to "skin friction," which applies to the friction between air and water as the water travels toward the fire. This friction consumes the energy imparted to the water droplets, consequently reducing velocity. This loss of velocity results in less penetration.
- (2) Skin friction also causes entrained air to be directed towards the fire which may or may not be desirable.
- (3) Extreme fineness of spray streams even at higher pressures, presents limitations. The water droplets must be large enough to reach the heated area around the fire.
- (4) Smaller drops of water are more easily disturbed by the drafts created by fires or otherwise, and thus may be prevented from reaching the area desired.
- (5) Ventilation and wind currents may reduce the effectiveness and reach of spray streams.
- (6) Large fires may demand good reach and large volumes of water. Most spray nozzles cannot accomplish both of these functions simultaneously.
- (7) operation on hot fires in confined spaces may make the area temporarily untenable for firemen to work efficiently due to hot steam and exclusion of oxygen.

GENERAL CONCLUSIONS

Spray streams are of excellent value in killing the heat of a large body of flame if accompanied by sufficient volume of discharge.

Volume of water is generally more important than any excess in pressure over that necessary to produce a stream which will reach the seat of the fire.

The reach of streams is an important factor and should not arbitrarily be discarded in favor of the extinguishing value of spray streams alone.

For certain types of fires under certain conditions spray streams are more efficient; if their characteristics are recognized.