Fire Protection with High Pressure Water Mist in the Tobacco Warehouse

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Outline

• Fire Risks in the Tobacco Warehouse
• Full Scale Fire Tests with High Pressure Water Mist in the Simulated Storage
• Site Fire Tests in the Tobacco Warehouse
• Summary
Fire Risks in the Tobacco Warehouse

- Concentration of large combustible storage with very high fire load
- Large buildings to protect the unit relatively independent
- Complicated fire hazards
  - Spontaneous Combustion
  - Fumigation fire caused by improper operation
  - Electrical fire / illegal use of fires
  - Arson
- Coexistence of various forms of fires (surface fire, deep-seated fire, flaming fire, smoldering fire etc), easy to form three-dimensional fires, difficult for fire fighting
- Huge losses caused the improper fire fighting will be much greater than fire losses
Alcoholization Warehouse

Tobacco leaf box
High-rack Warehouse

Cigarette box
July 5, 2008, Arson fire in Hainan Hongta cigarette factory,
Fire loss: 0.23 billion
December 28, 2008, Spontaneous fire in Yongzhou tobacco warehouse, Fire loss: 0.12 billion
Requirements of fire extinguishing system in the tobacco warehouse

- Efficient and reliable for early fire extinguishing
- Continuous fire fighting ability for re-ignition
- Reduce the losses caused by fire fighting
- Safe and reliable to avoid losses caused by malfunction
- Low operating costs, convenience for repair and maintenance
- Adaption to the tobacco Production technology
- Environmentally friendly
Application of High Pressure Water Mist System in the Tobacco Warehouse
Simulated Fire tests (1)

Ceiling closed nozzle
K=2.04, RTI<20, P=10MPa, 57°C

12.0m × 12.0m × 5.6m (high), single floor storage
Simulated Fire tests (2)

Ceiling closed nozzle
K = 2.04, RTI < 20, P = 10 MPa, 57°C

Built-in closed nozzle
K = 1.25, RTI < 20, P = 10 MPa, 57°C

12.0m × 12.0m × 8.5m (high), high-rack storage
Combustibles

- tobacco leaf
- Cigarette
Design fire Scenario (1)

(a) tobacco crib test
Max Nozzle space: 3.5m
Design fire Scenario (2)

(b) High-rack storage test
Max Nozzle space: 3.0m
Tobacco crib test results

Free burning  Nozzle activated  Fire suppressed

Surface fire extinguished  Fire fighting with mist gun  Total Fire extinguished
Tobacoo crib test results

Temperature change during the test
High-rack storage test results (1)

Free burning

Nozzle activated

Fire extinguished

After Fires
Temperature change during the test
High-rack storage test results (2)

Nozzle activated

Fire extinguished

Fires spreading from the under box
High-rack storage test results (2)

Temperature change during the test
Site fire tests in Yunnan Hongta tobacco warehouse

27.0m × 36.0m × 5.6m (high), single floor storage
Totally 12 tobacco cribs, each crib is 7m long, 6m wide and 4m high.
Site fire tests setup

Open nozzle activated by air sample detection system
K=0.95, P=10MPa, Max nozzle space 3.0m
Site fire test results – Surface fires
Site fire test results – deep-seated fires
Site fire tests in Guangdong Shima tobacco warehouse

Ceiling closed nozzle
K=1.25, RTI<20, P=10MPa, 57°C
Max nozzle space 3.0m

HP water mist pipe

8.0m × 7.0m × 4.0m (高)
Combustibles

Cigarettes (200 boxes)
Design fire Scenario

Arson fires with gasoline
Site fire test results – Arson fires

Ignition

Nozzle activated

Fire suppressed

Flame fire extinguished
Site fire test results – Arson fires

- Re-ignition
- Nozzle activated
- Fire suppressed with mist gun
- Total fire extinguishment
Summary

- Fire protection is very important in the tobacco warehouse because of the high value. High pressure water mist system with less water and less water damage is regarded as priority option in the tobacco warehouse.

- Both simulated and site fire tests showed that high pressure water mist could extinguish surface fires of tobacco crib less than five minutes, while deep seat fires or smolder fires would only be controlled or suppressed. However, the decline of fire temperature was conducive to firefighters quickly approaching and fighting fire. High-pressure water mist gun was proved to a good manual fire fighting way in the tobacco warehouse.

- Further work was carried on evaluating the risk of water mist on fumigation. Because in the fumigation of tobacco leaf, aluminium phosphide was used as the pesticide. However there was risk of explosion due to the pesticide decomposition products reaction with water.
Thanks!

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