

#### **Protection of Industrial Oil Fryers**

▲ AquaMist

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#### Agenda: Protection of Industrial Oil Fryers

- Introduction to Industrial Oil Cookers / Fryers
- Approval testing to FM5560
- Project Application





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# What is an Industrial Fryer?

- Precooked Appetizers
- Breaded Meats
- Potato Chips
- French Fries
- Doughnuts
- Chicken
- Fish







# What is an Industrial Fryer?

- Large cookers of food products
  - Oils used as cooking medium
  - Up to 18900 I of oil
- Cooker typically includes:
  - Primary Cooking Area
  - Takeout Area
  - Fines Box
  - Exhaust Stack(s)
- Placed in large industrial manufacturing environments









# **Industrial Fryer Components**



# **Standards, IFP Approval, and Testing**

- Carbon dioxide is commonly used for industrial oil cooker protection.
  CO2 cannot manage re-ignition
- Food industry requirement for Watermist as alternative fire protection option.
- 2000/2001 first fire testing with Watermist on industrial oil cookers
- Approval Standard 5560 for Water Mist Systems is developed and released in 2005. (Appendix J, 2012)
- Fryer food factories are considered High risk premises by all insurers with a Business interruption cost potential
- Why FM5560? Full scale fire testing matching hazard, includes component testing



#### Standards, IFP Approval, and Testing

#### FM Water Mist Systems Standard

- Class Number 5560, J. Nov. 2012
- Protection of the primary cooking area <u>only</u>, not protection of the takeout area, exhaust stack(s), fines box, or any other areas or components.
- Component & Nozzle Testing
- Fire Testing

< FM>	Ce	rtificate o	of Compliance		
$\sim$	System Designation:	AQUAMIST Type System for the Prote	Industrial Fire Protection (IFP) Fire Suppression ection of Industrial Oil Cookers		
APPROVED	Design, Installation, Operation and Maintenance Manual:	AQUAMIST Type System Design, Inst Document No. TFP	Industrial Fryer Protection (IFP) Fire Suppression tallation, Operation and Maintenance Manual, 2240, Revision October 2013		
	Prepared for		Manufactured at:		
	TYCO FIRE PRODUCTS, LP 1467 ELMWOOD AVENUE CRANSTON, RI 02910 UNITED STATES		TYCO FIRE PRODUCTS, LP 1467 ELMWOOD AVENUE CRANSTON, RI 02910 UNITED STATES		
		FM Approv	vals Class: 5560		
	Approval Identification: 3047379		Approval Granted: October 16, 2013		
	To verify the availability of the Approved product, please refer to www.approvalguide.com or www.roofnav.com				
	Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an culture resource of FM Approvals.				
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FM Approvals-
Approval Standard
Water Mist Systems
Class Number 5560
November 2012
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# Standards, IFP Approval, and Testing

#### Nozzle Testing

- Corrosion (salt spray & boiling Magnesium Chloride)
- Vibration
- Rough Use and Abuse
- High & Low Temperature Exposure
- Minimum Operating Pressure

#### **Component Testing**

- Valve Seat Leakage
- Extreme Temperature Operation
- Salt Spray Corrosion
- Friction Loss Determination
- Cycle Testing

These tests are designed to prove dependability in extreme environments



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# **Approval testing to FM5560**

Fire Testing per FM 5560, 2012

 Appendix J: Fire Tests for Water Mist Systems for the Protection of Industrial Oil Cookers

**Primary Cooking Area Dimensions** 

- Mock-Up A: 8.0 ft (2.4 m) wide by 8.0 ft (2.4 m) long (1 x L)
- Mock-Up B: 8.0 ft (2.4 m) wide by 16.0 ft (4.8 m) long (2 x L)
- Mock-Up C: 8.0 ft (2.4 m) wide by 24.0 ft (7.2 m) long

Test	Mock-Up	Hood Position
1	А	Up
2	А	Down
3	В	Up
4	В	Down
5	С	Up
6	С	Down

We have proven unlimited fryer length scalability through thorough fire testing; the results suggest there is no trend between fryer length and rapid extinguishment reliability



 $(3 \times L)$ 



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# **Approval testing to FM5560**

Fire Test Approval Criteria

- Extinguish Auto Ignition Point (AIT) fire inside oil cooker mockup, regardless of hood position
- Extinguish all open flames within 1-minute of system discharge
- Cool oil so its average temperature is below the oil's flash point within 2 min of system discharge
- Design Duration shall be twice the cooling time to get below Flash point, or 10 minutes, whichever is greater
- No excessive fire flare-ups, micro explosions of oil reacting with water, or splashing of burning oil



# **Approval testing to FM5560**

#### **JCI** Fire Tests

- More than 50 full-scale fire tests were performed
- 14 tests were witnessed by FM Global in JCI Test Facility, USA













# **Approval testing to FM5560**

Mock-Up A: 8.0 ft (2.4 m) wide by 8.0 ft (2.4 m)







# **Approval testing to FM5560**

Mock-Up C: 8.0 ft (2.4 m) wide by 24.0 ft (7.2 m) long (3 x L)



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# **Approval testing to FM5560**

Mock-Up C: 8.0 ft (2.4 m) wide by 24.0 ft long (7.2 m) (3 x L)



## **Characteristics Industrial Fryer Protection**

- Objective: Extinguishment and cooling
- Key points
  - Open Deluge local application systems
  - Class K fires Cooking Oils
  - Flame cooling / Oxygen displacement
  - Radiant heat blocking
- Min nozzle design pressure 11.7bar
- Nozzle flow 14lpm
- System demand flows 200 600lpm













# **System Operation**





# **System Operation**





# **System Operation**



## **Typical Schematic**







# **System Layout**



# **Challenges / future**

- Distance hood/nozzle to oil surface
- Oil depths of 20inch....
- Additional PBD specific testing....



Nozzle installation height over oil surface		Max nozzle spacing along fryer length		
in	cm	in	cm	
54	137	60	152	
28	71	60	152	
27	69	58	147	
26	66	56	142	
25	64	54	137	
24	61	52	132	
23	58	50	127	
22	56	48	122	
21	53	46	117	
20	51	44	112	
19	48	42	107	
18	46	40	102	







# **Project Application**

- Industrial Fryer
  - 13m length
  - 2.4m width
  - 20 ton/hrs. of French Fries
  - 26 nozzles (2 rows)
  - 2 zones per fryer
    - Fryer, takeout area, stacks
    - Filter
  - Total flow demand 360lpm
  - Min 10 minutes discharge
  - Activation by heat detectors







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#### **Installation examples**



![](_page_22_Picture_4.jpeg)

![](_page_22_Picture_5.jpeg)

#### Installation examples

![](_page_23_Picture_2.jpeg)

![](_page_23_Picture_3.jpeg)

![](_page_23_Picture_4.jpeg)

![](_page_23_Picture_5.jpeg)

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#### **Installation examples**

![](_page_24_Picture_2.jpeg)

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#### **Installation examples**

![](_page_25_Picture_2.jpeg)

![](_page_25_Picture_3.jpeg)

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![](_page_25_Picture_5.jpeg)

![](_page_25_Picture_6.jpeg)

# Summarizing

- FM Approved (FM5560) low pressure water mist systems that can protect (extinguish fires) one or more industrial deep fat fryers within a single facility
- Large scale industrial fryers up to 8 ft (2.44 m) wide & of unlimited length
- Protection of the primary cooking area; plus takeout area, exhaust stack(s), fines box, or any other areas or components.
- Proven performance and tested for the food industry
- Approved by third party through fire testing and component tests
- Minimize business interruption cost potential, preference in the food industry
- Does not harm humans and production process
- Is an eco-friendly green technology
- Very low water demand needed
- Choice of food industry leaders and insurer companies

![](_page_26_Picture_12.jpeg)

![](_page_27_Picture_0.jpeg)

![](_page_27_Picture_1.jpeg)

#### **Questions?**

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![](_page_27_Picture_5.jpeg)

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#### Thank you!

![](_page_28_Picture_2.jpeg)

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![](_page_28_Picture_5.jpeg)

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