



Protection of Industrial Oil Fryers

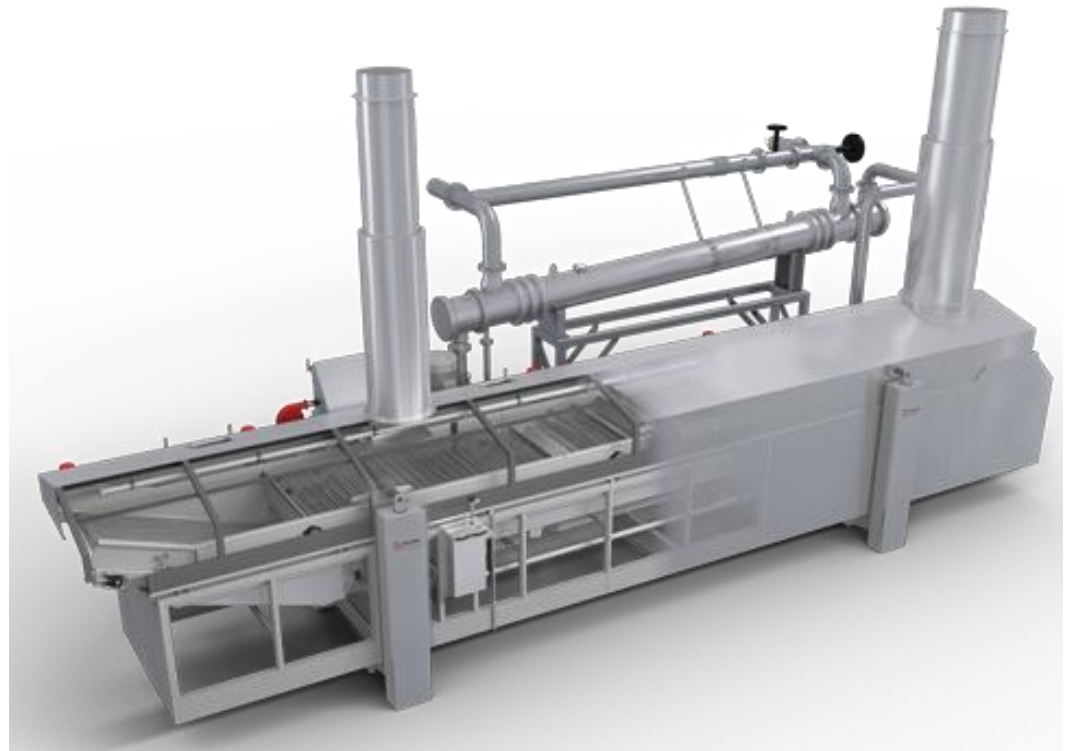
 AquaMist

Dirk Laibach
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Agenda: Protection of Industrial Oil Fryers

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



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

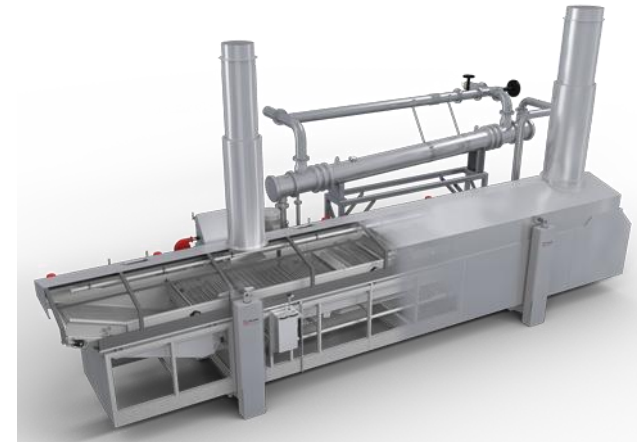
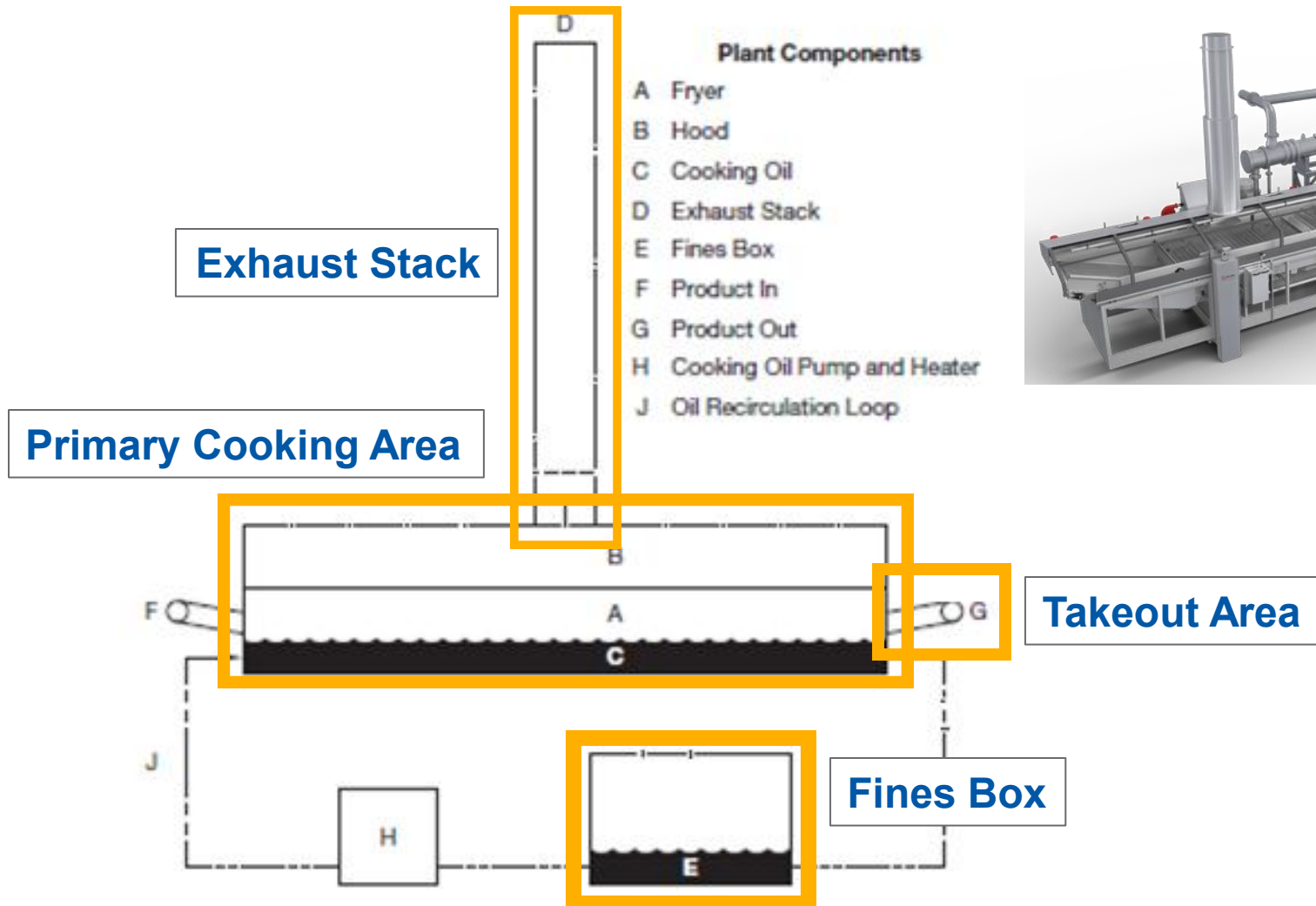
- Oils used as cooking medium
- Up to 18900 l of oil

Cooker typically includes:

- Primary Cooking Area
 - Takeout Area
 - Fines Box
 - Exhaust Stack(s)
- Placed in large industrial manufacturing environments



Industrial Fryer Components



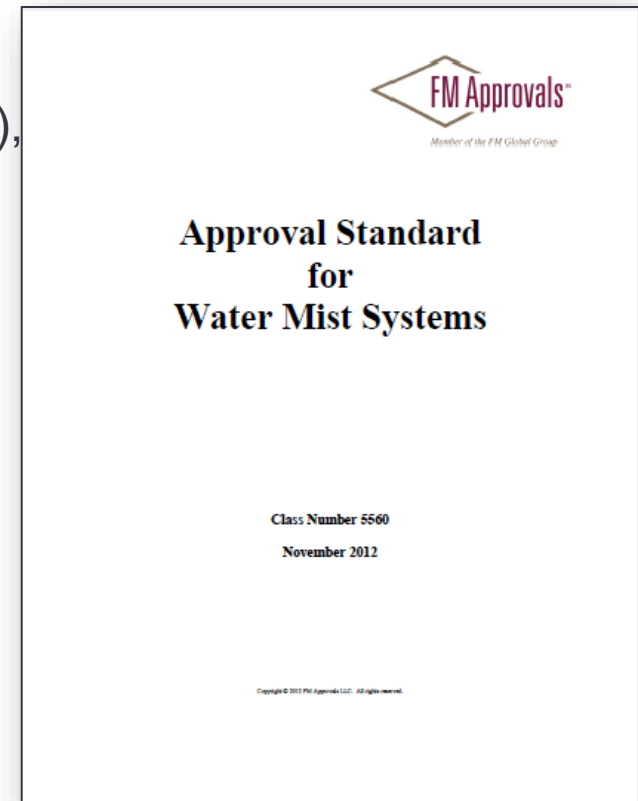
Standards, IFP Approval, and Testing

- 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 only, not protection of the takeout area, exhaust stack(s), fines box, or any other areas or components.
- Component & Nozzle Testing
- Fire Testing



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**



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 (3 x L)

Test	Mock-Up	Hood Position
1	A	Up
2	A	Down
3	B	Up
4	B	Down
5	C	Up
6	C	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

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)



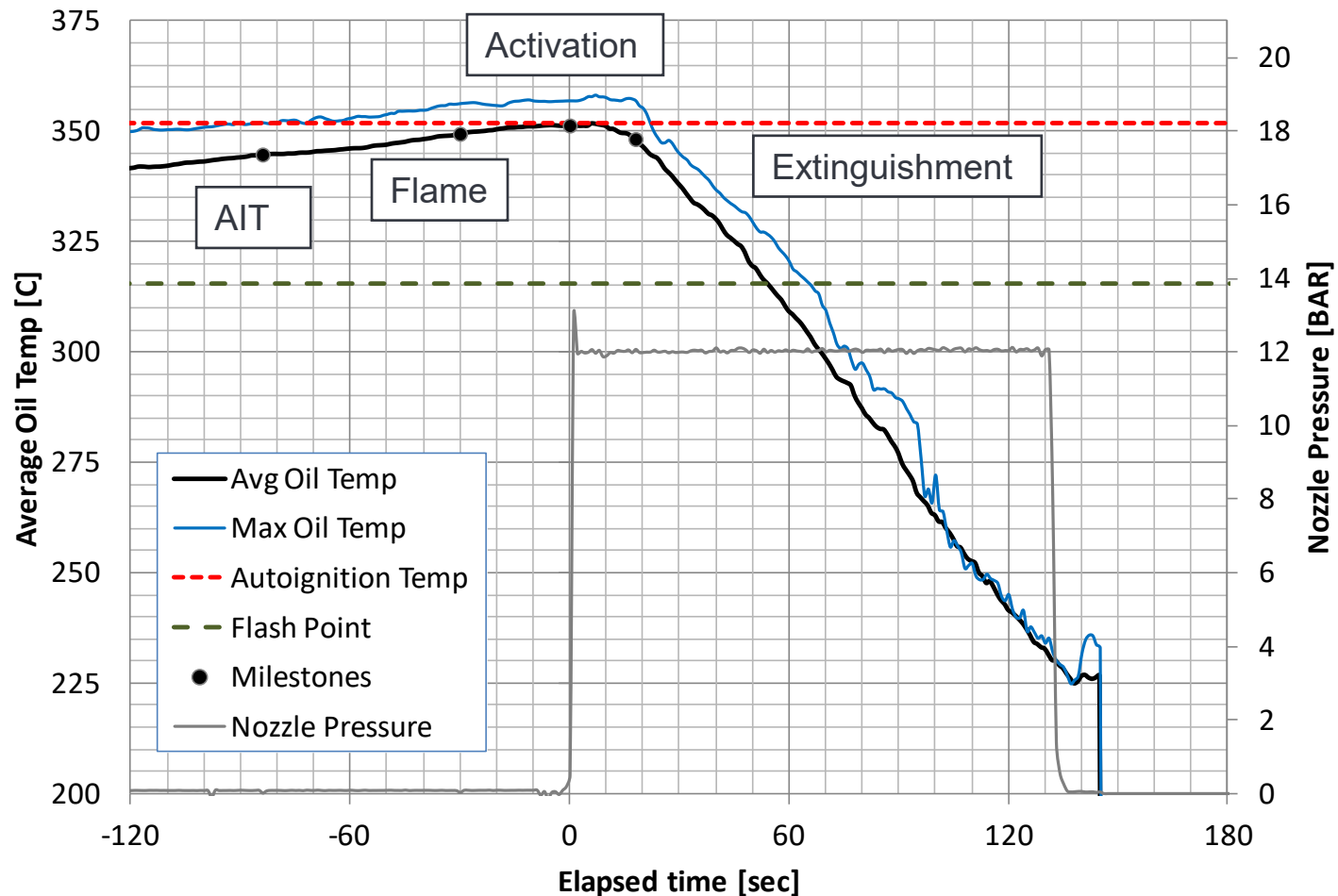
Approval testing to FM5560

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



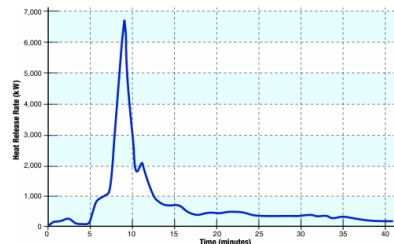
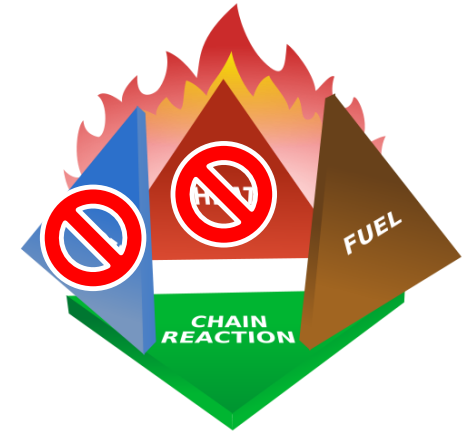
Approval testing to FM5560

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

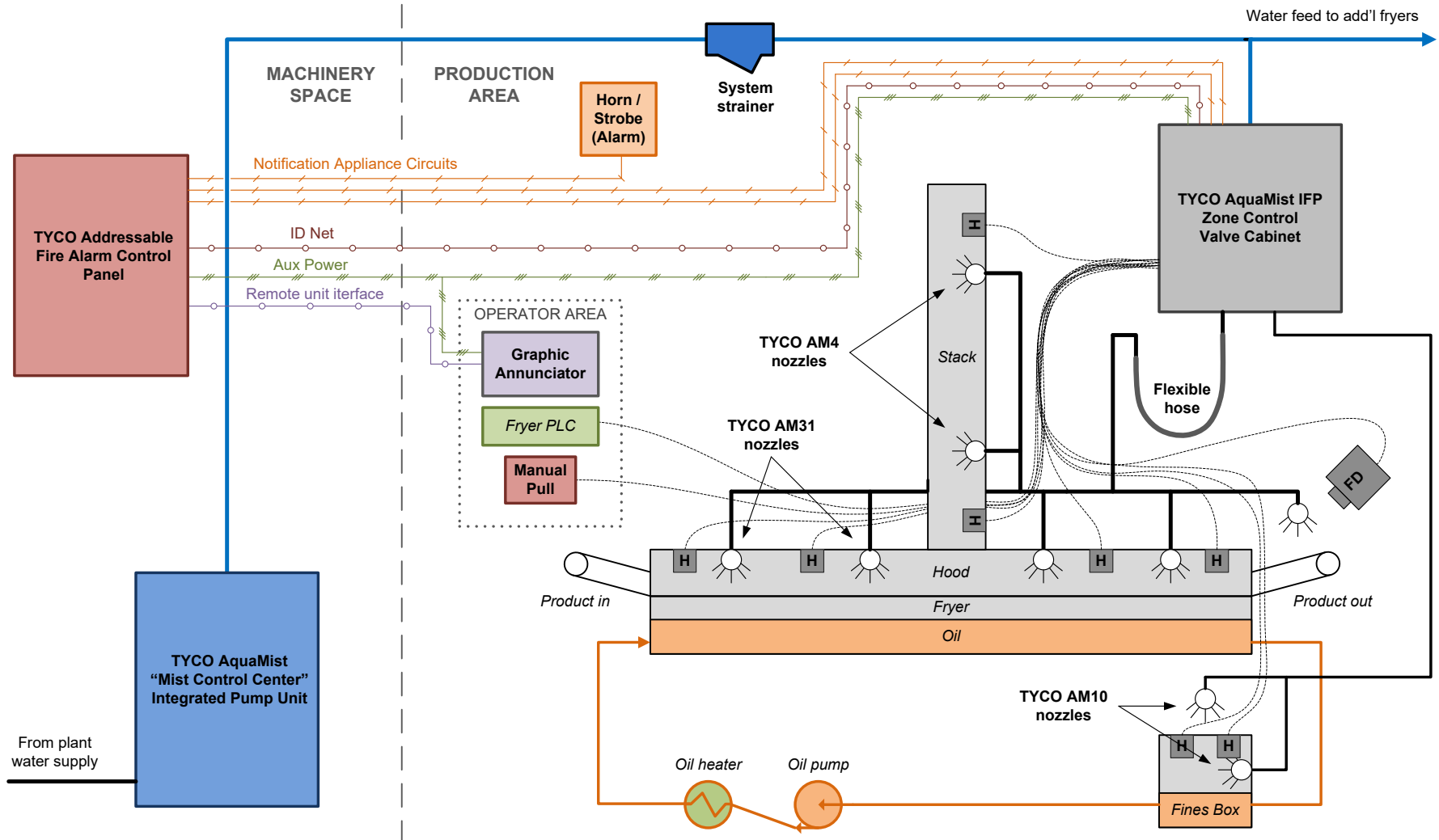


Characteristics Industrial Fryer Protection

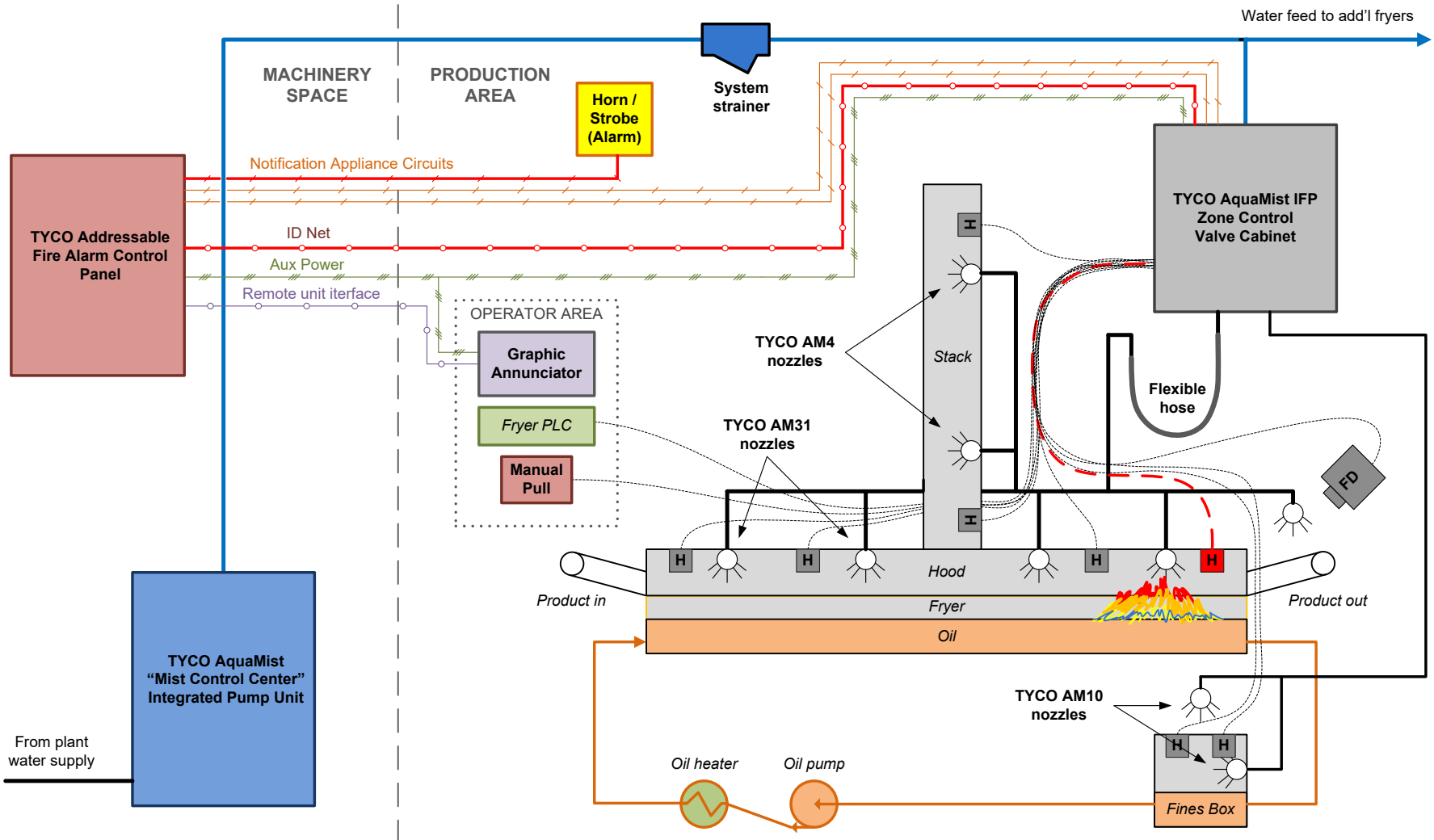
- Objective: Extinguishment and cooling
- Key points
 - Open Deluge local application systems
 - Class K fires – Cooking Oils
 - Flame cooling / Oxygen displacement
 - Radiant heat blocking
- Min nozzle design pressure 11.7bar
- Nozzle flow 14lpm
- System demand flows 200 – 600lpm



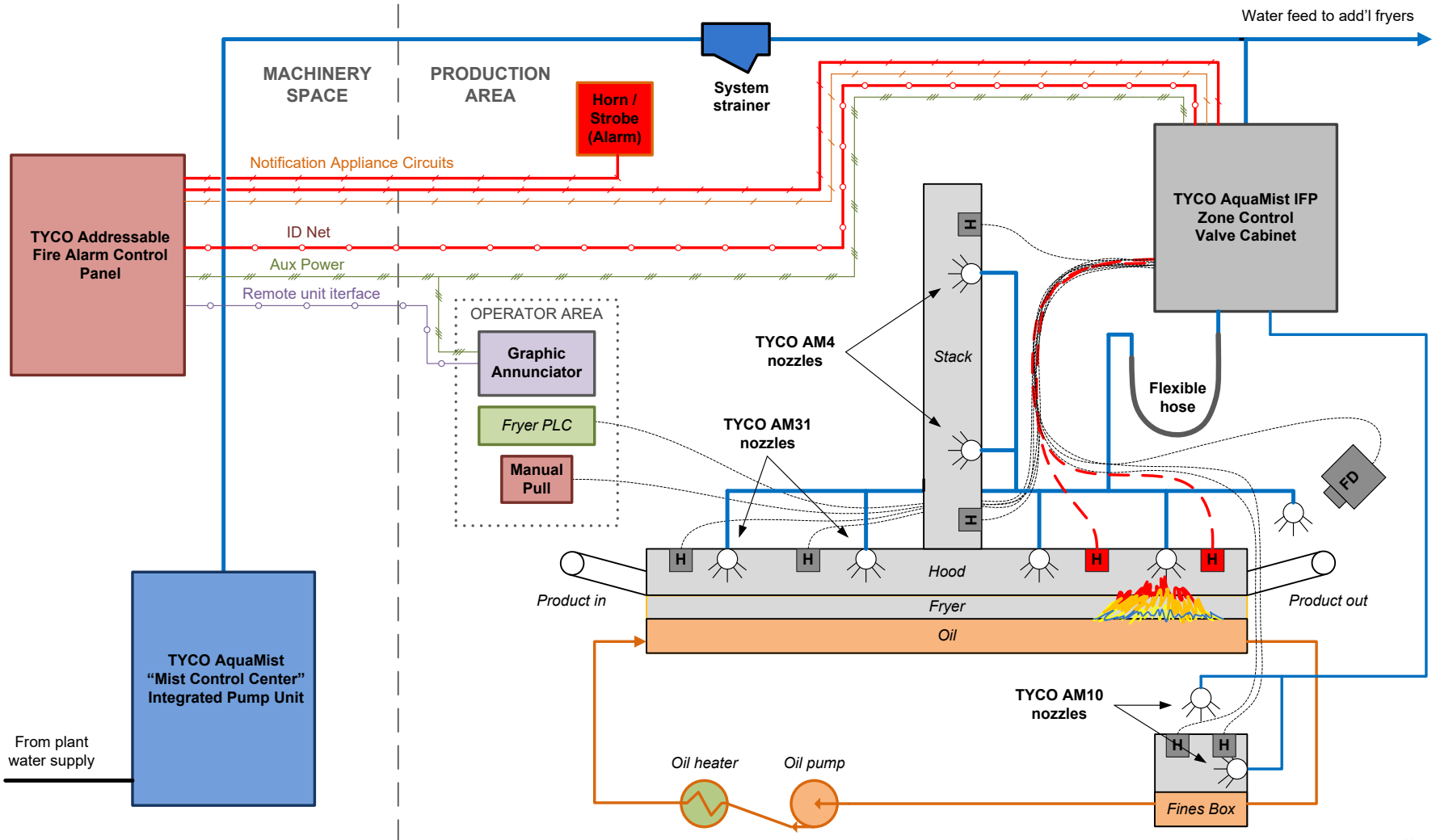
System Operation



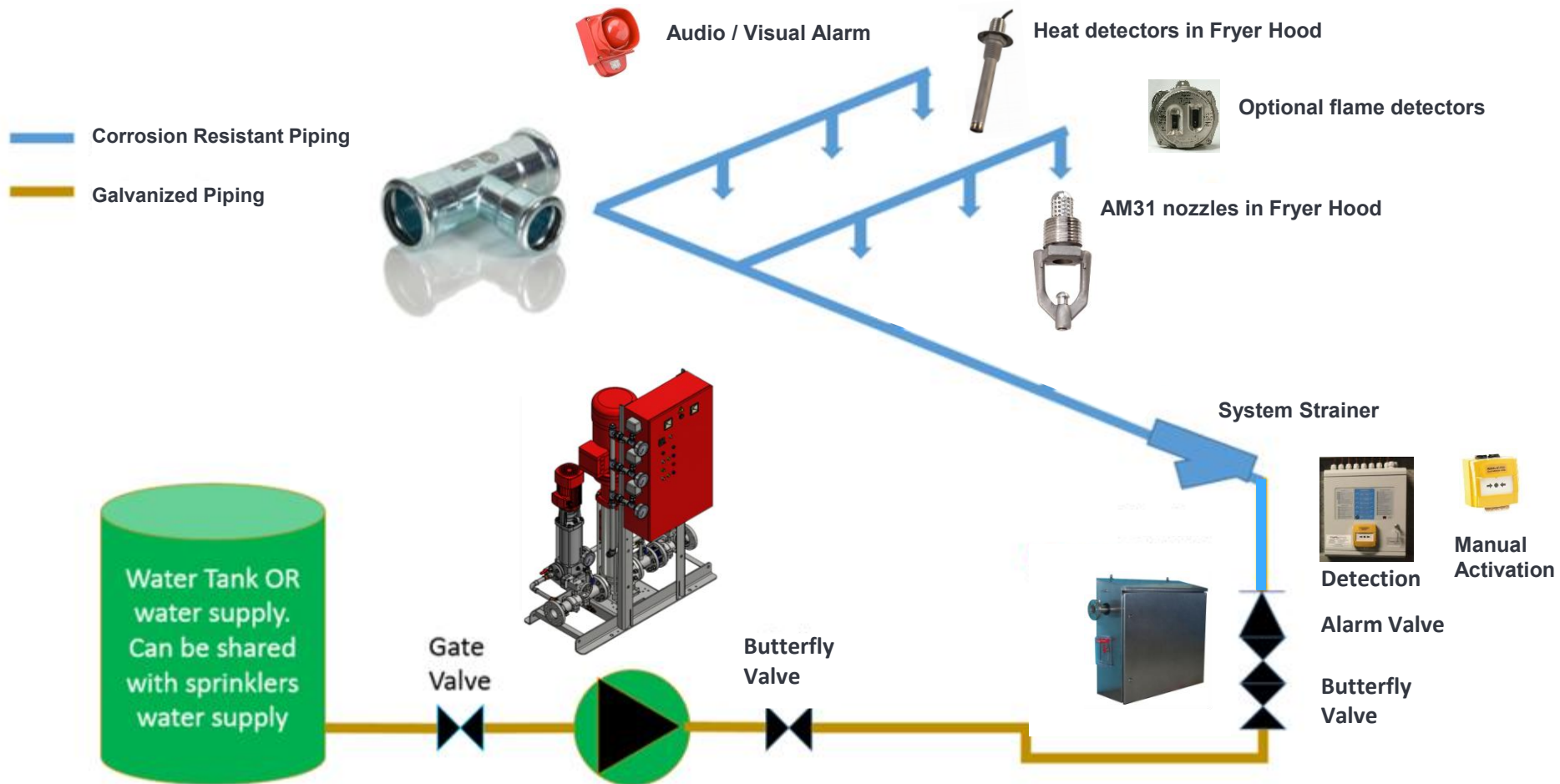
System Operation



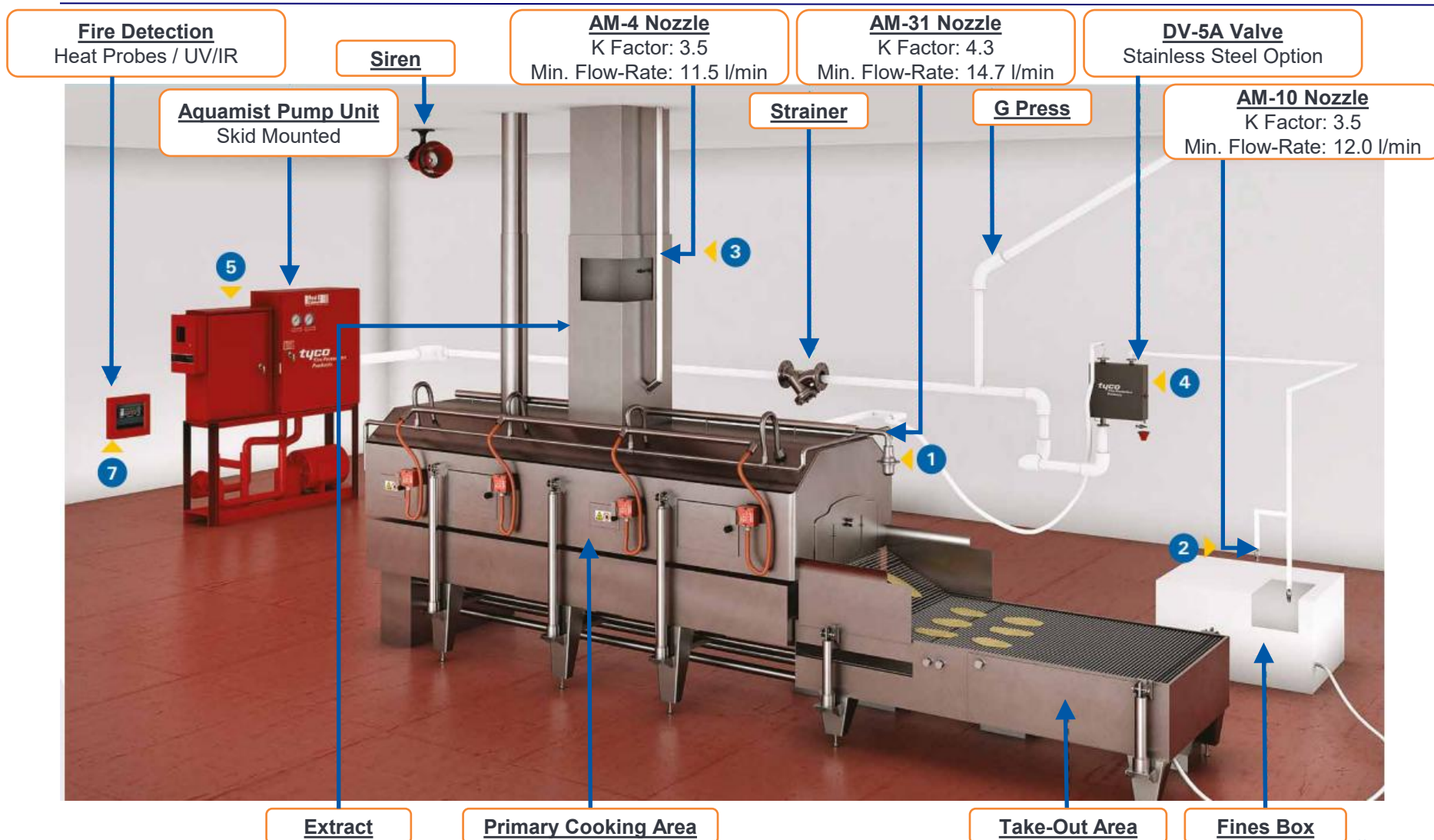
System Operation



Typical Schematic

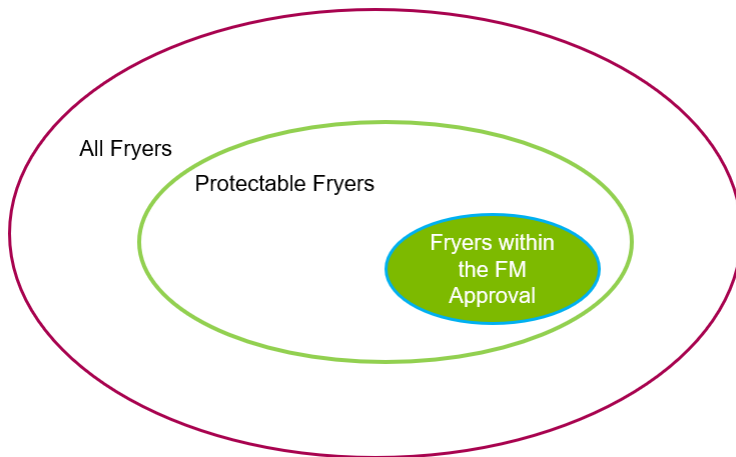


System Layout

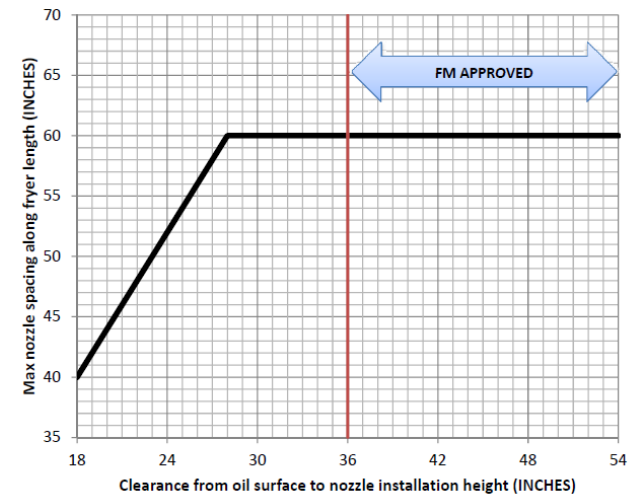


Challenges / future

- 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



Installation examples



Installation examples



Installation examples



Installation examples



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



Questions?



Thank you!



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