Safe Storage of Paper & Waste Paper and Its Handling for Accident Free Operation

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Efficient Collection & Processing of Recovered Paper For Achieving Improved Yield and Quality

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Fire Hazards

- Past few incidents reported on-

05.11.2021	18.02.2022	27.04.2022
22.05.2022	02.11.2022	06.03.2023
14.05.2023	29.05.2023	(8 nos. in 24 months.)

- Estimated monetary loss: **>150 crores**

- Last paper published in IPPTA- Sept. '86 (37 Years back)

The Common Factor

- What we usually hear about (almost) every fire mishap-
  - The fire fighting arrangements were inadequate.
  - Owners were careless about fire safety.

- Most of the time, we believe this.

A Few Questions!

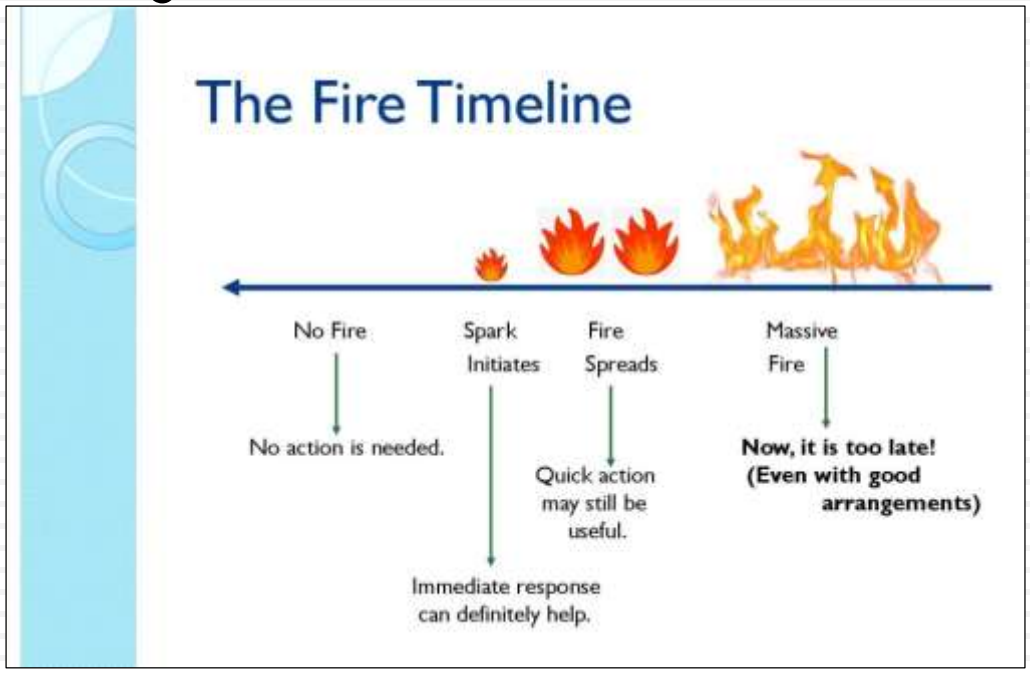
- What is the definition of adequate?
  - National Building Code, 2016
  - Developed countries standards
  - Other
- Most secure areas have also faced fire incidents. Were the arrangements inadequate?
- Do you have adequate fire preventing arrangements in your own kitchen, bedroom?

Usual fire fighting arrangements

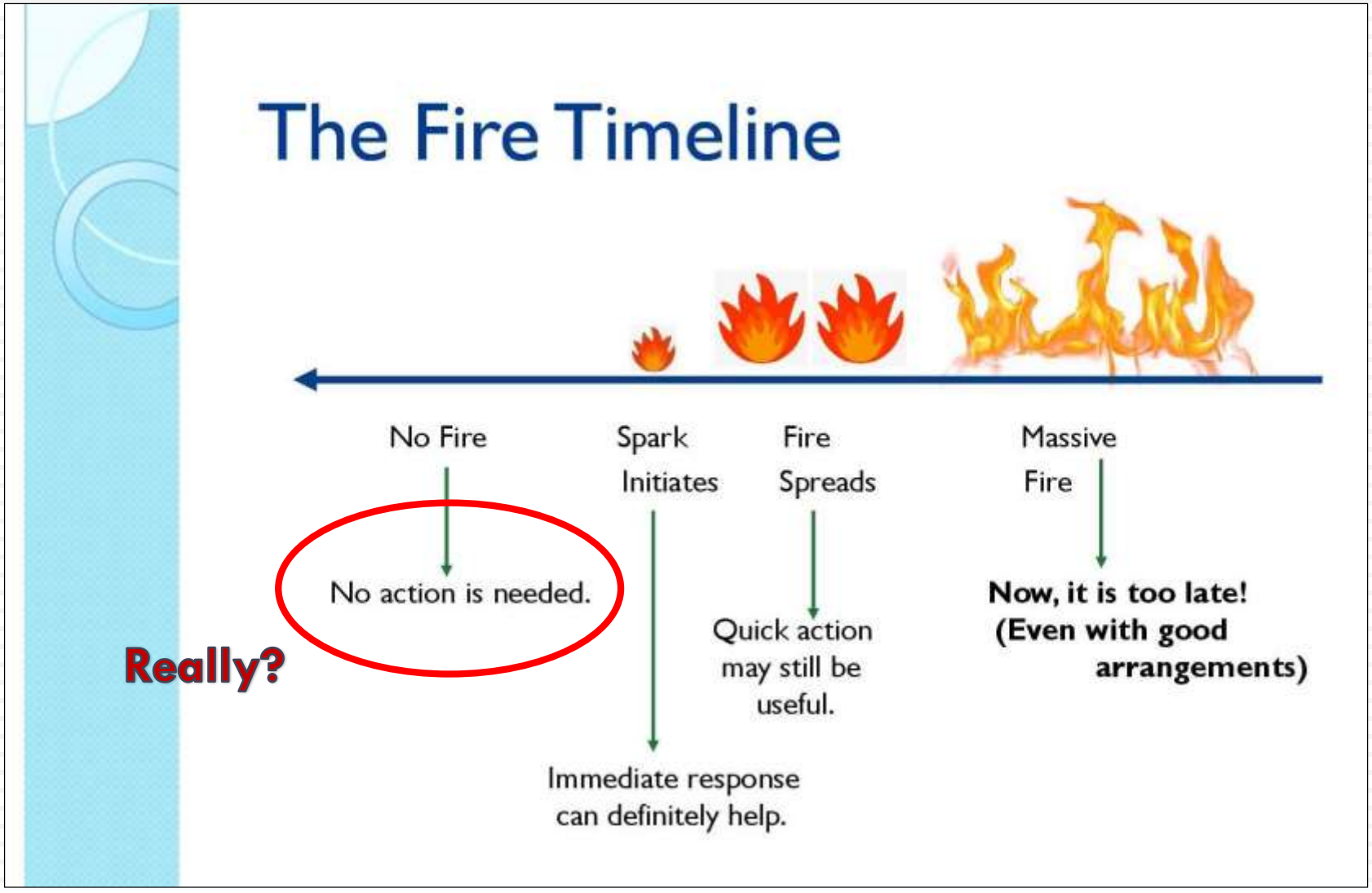
- These include-
  - Policies
    - Restricting matchbox, bidi, cigarettes etc.
    - Restricting unauthorized access etc.
  - Fire Hydrants / Extinguishers / Systems
  - Trained Manpower

The Fire Timeline

- Any fire accident may be divided in 4 sections-
  - Before fire takes place
  - Spark / Beginning of fire
  - Immediately after fire begins
  - Afterwards



The Timeline…



Arrangements

- Arrangements MUST be there in place, ready to use at any moment of time. Because-

Many of the world's largest fire accidents could have been avoided by just a cup of water if it was poured on the right time, at the right place.

An Example- Crossing the Road!

- What if someone teaches you like this-
- Before crossing the road, get latest traffic updates.
- Before crossing the road, locate nearest doctor.
  - In case of emergency, you may quickly get medical help.
- Keep a pen and paper handy while crossing the road.
  - If any vehicle hits you, note down the vehicle registration number to file FIR.

Our Approaches

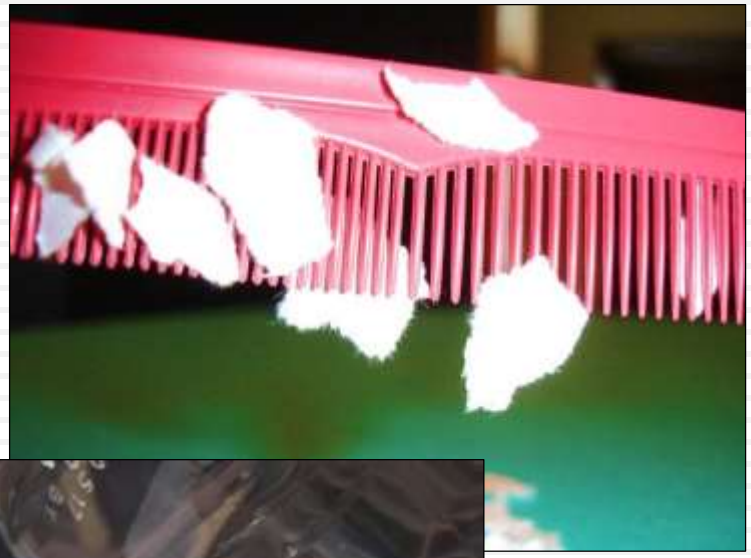
- Do our arrangements teach us how to cross the road safely, or just guide us for after-accident situation?

- Existing rules and systems are all OK, but if *something goes wrong,* a loss is certain; and we must explore ways to avoid such accidents in the first place.

What Can Go Wrong?

Focused Radiation

Static Charge



So, What Should be Done?

- Understand Paper (& Waste Paper)
  - Cellulosic like wood, textile, cotton, bagasse
  - Non-exothermic like bagasse
  - Physical shape (forget 2D network definition.)
  - Hygroscopic

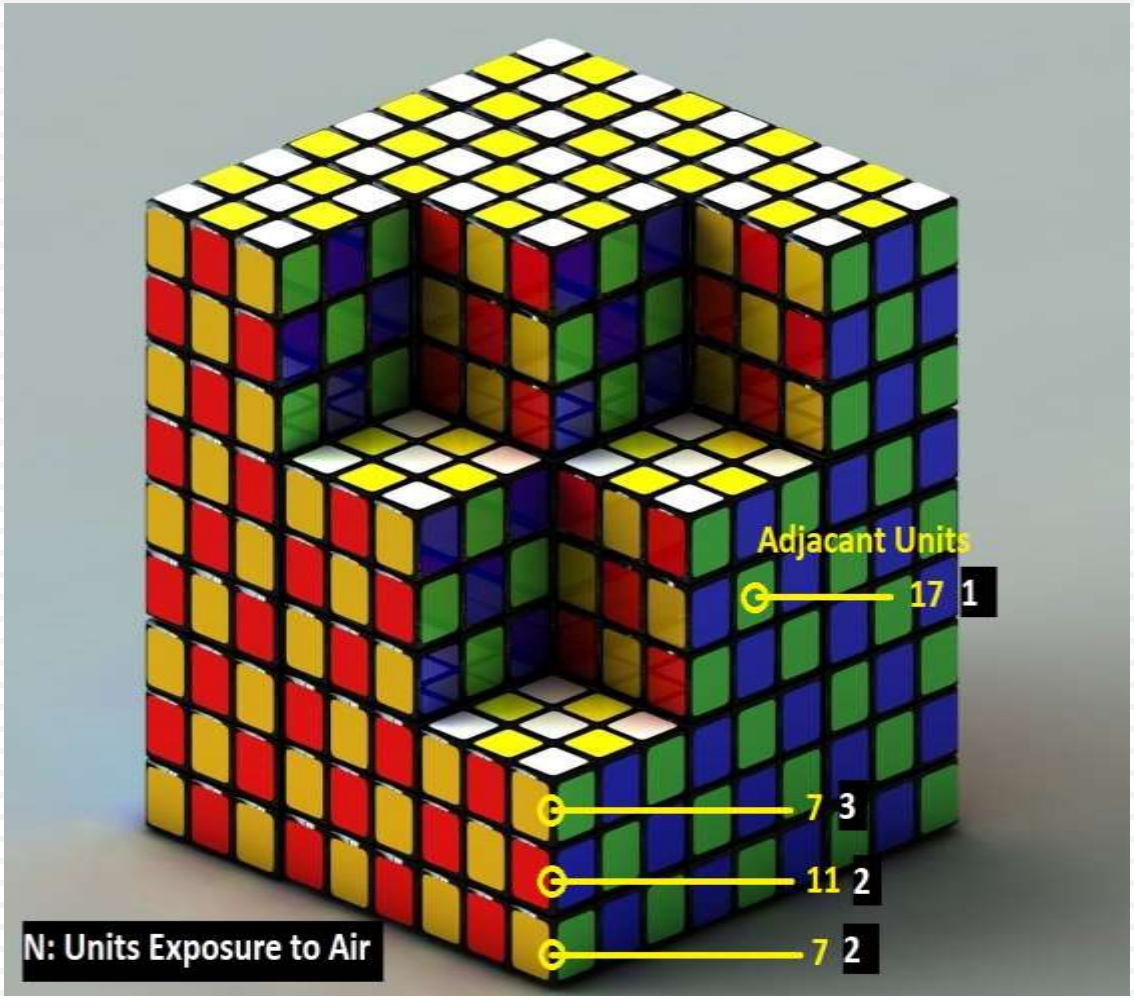
Physical Shape

Improving Storage Systems

- Storage systems must have lesser open areas to enhance safety.
- Care should be taken to ensure that the storage areas are densely packed.
- Analysis of fire spreading possibility to be made.

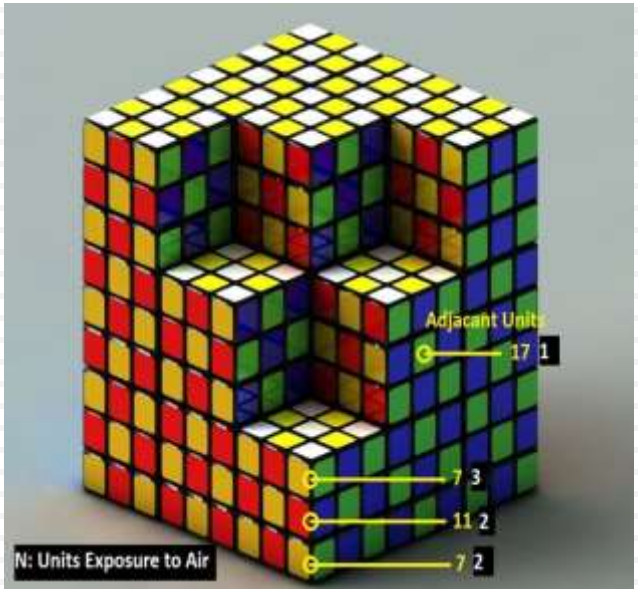
- Confusing? Let's move to next slide.

Fire Sensitive Combustion Prone Block

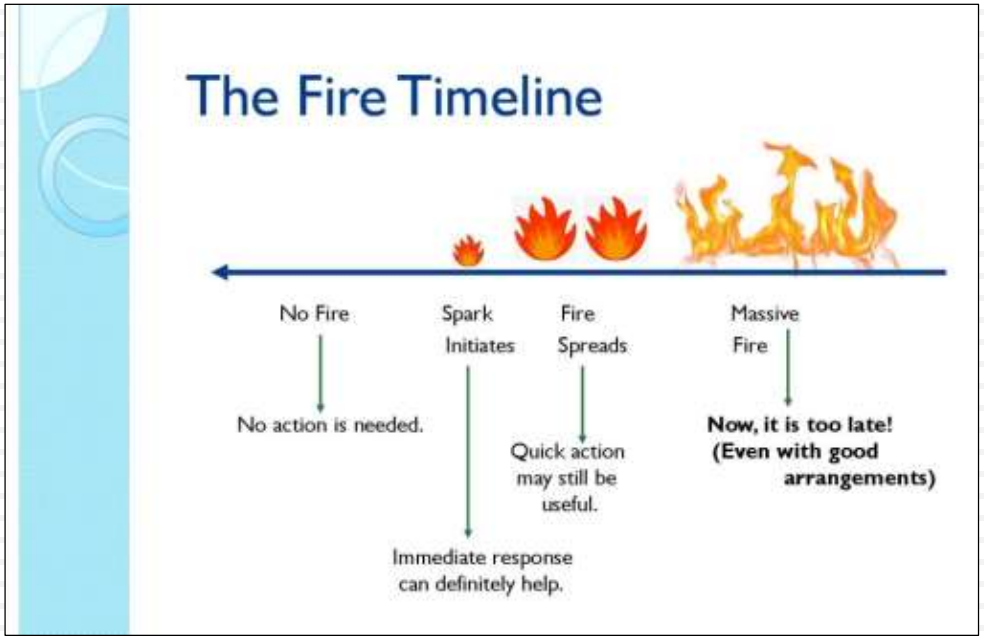


Fire Sensitive Combustion Prone Block

- Just a simple model to demonstrate!
- Need to focus more on exposed units.
- Further detailed research MUST be initiated.



Increasing Time…



Increasing Time

- Paper moisture can be your best shield against fire.
- Example: Hawan
- But, how?
- Paper is hygroscopic.
- So what?

Effect of Moisture

- Heat required to increase temperature for 1 kg-
  - Dry paper: 1 x 0.25 x (200-40) = **40 kCal**

- If paper contains 10% moisture, then
  - For paper: 0.9 x 0.25 x (200-40) = 36 kCal
  - For water: 0.1 x 1.00 x (200-40) = 16 kCal
  - Latent Heat of Water: 540 X 0.1 = 54 kCal
  - Total **106 kCal**

Increase RH

- Increase relative humidity in the nearby areas
- Moisture in paper increases, automatically
- Also cools down the ambient temperature
- Static charge problem is reduced
- Use of treated effluent is possible

- But how?

Misting/Humidification

- Reduces temperature
- Increases humidity

Humidification

- An effective approach for open yards
- For closed finished paper godowns, intermittent use.
- No harmful effect on paper quality
- Reduces static charge related issues also
- Easy to implement
- Low water quantities required
- Easy

Future Work

- **Initiate** R&D on fire safety EXCLUSIVELY for paper mills.
- Develop a charter for fire prevention in paper mills.
- Share knowledge and information with all paper professionals.
- Collectively aim for a "NO FIRE ACCIDENT" for paper mills.

- In any mill, R&D institution, association or academic institution initiates in this direction, I'd say-

THANK YOU!

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