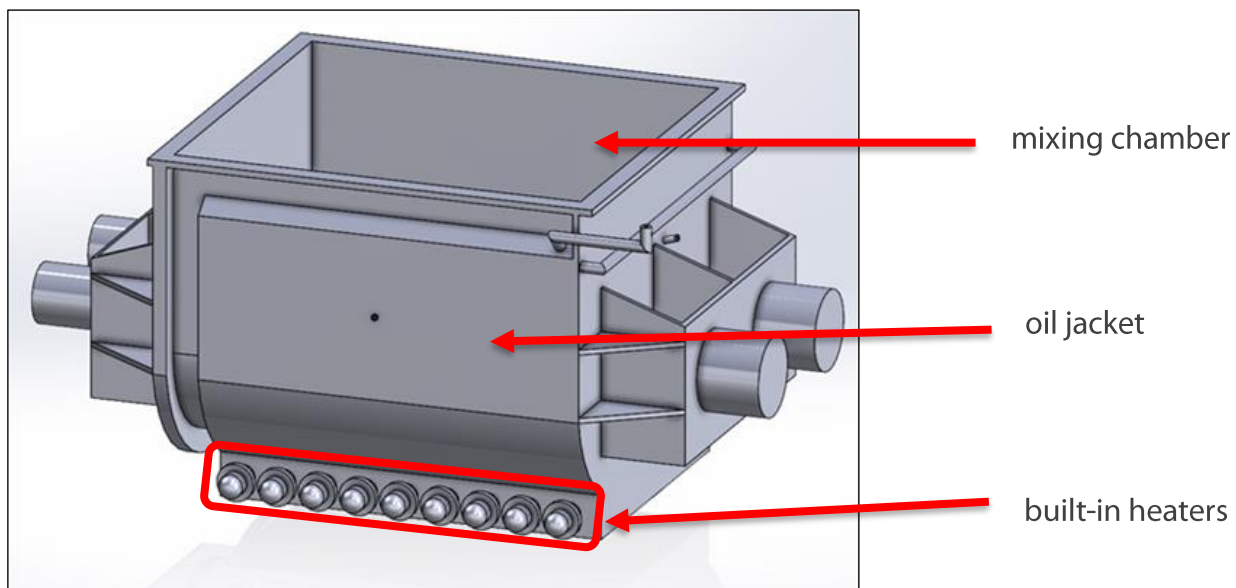


SUMMARY OF INQUIRY COMMITTEE REPORT FOR ACCIDENT AT STARS ENGRG PTE. LTD.

A large explosion occurred at Stars Engrg Pte Ltd's ("Stars Engrg") premises on 24 February 2021. The accident resulted in three deaths, five major injuries, two minor injuries, and severe property damage. An Inquiry Committee ("IC") was appointed soon after the accident.

Brief IC report summary

Stars Engrg's worksite was used to manufacture fire-retardant wraps or "fire clay". One of the main work processes involved the use of a heated mixer machine, which came with an external jacket for heat transfer fluid and built-in heaters. A key ingredient for the "fire clay" was potato starch powder.



Back view of the mixer machine

How the explosion occurred

The explosion occurred across two steps:

1. Overheating of the heat transfer oil and the use of the oil jacket as a closed system resulted in over-pressure within the mixer's oil jacket, causing it to rupture.
2. The heat transfer oil in the jacket was released and aerolised into fine droplets, which ignited, leading to the explosion. The explosion overpressure lifted combustible potato starch powders in the workplace and subsequent flash fires occurred when the suspended potato starch powder in the worksite were ignited.

The main cause of the accident was the unsafe use of the mixer machine:

Unsafe use of mixer machine	Insufficient oil in the mixer's oil jacket caused poor heat transfer and overheating of the oil.
	Temperatures of the heat transfer fluid in the oil jacket were not monitored. Only temperatures of the contents in the mixing chamber were monitored.
	All the mixer machine's vents were sealed off, and pressure within the oil jacket was not monitored. Pressures built up in the oil jacket due to the high temperatures that the oil was subjected to.
	Repeated heating and cooling weakened the mechanical strength of the oil jacket, and the weld repairs done by Stars Engrg's workers were of poor quality. The oil jacket eventually ruptured at the weak points, fracturing at the weld seams.

The first explosion from the oil jacket caused the most damage and injuries. The flash fires which followed were likely caused by the combustion of potato starch powders accumulated within Stars Engrg's premises.

Gaps observed included:

Gaps observed	Misuse of mixer machine, including: <ul style="list-style-type: none">• Lack of competent person(s) to start up and operate the mixer, as well as solve operational problems.• Inadequate risk assessment for the operation of the mixer.
	Multiple red flags that served as warning signs were ignored.
	Potato starch powders were allowed to accumulate at the worksite.
	Lack of an emergency response plan to ensure effective and efficient evacuation.
	Not providing or ensuring the use of personal protective equipment such as fire-retardant clothing.

Recommendations

The IC recommended the following to prevent the recurrence of similar accidents:

Safe use of machines:

- Buyers of industrial equipment are encouraged to certify purchased equipment to SS 537-1: Code of Practice for the Safe Use of Machinery – General Requirements.
- Review and expand the Fifth Schedule of the WSH Act to include higher-risk machineries.

Safe use of combustible dusts:

- Suppliers of materials that pose a defined level of combustible dust hazard to include a label explaining the hazard.
- Companies that handle beyond the maximum quantity of specified combustible powders to register or notify the authorities.
- Occupiers to inform building owners or landlords on the use of combustible powders, so that the work amongst tenants can be coordinated for safety.

More outreach and guidance efforts to be conducted, specifically directed towards small and medium enterprises, as well as workers who may be at risk.

For more information, please refer to the [Report of the Inquiry Committee for the accident at Stars Engrg Pte Ltd on 24 February 2021.](#)