

SAFETY FLASH – Hotplate Fire



Overview:

Above are photos, taken two days apart, which show significant damage caused by a fire in a campus research laboratory. Burn patterns suggest that the source of the fire was most likely a hotplate within the laboratory fume hood. Shortly after the fire, the NDSU Safety Office was contacted by safety officials at other universities and one national lab and the information they provided supports the conclusion that a defective hotplate could have been the cause. Details can be found at <https://dchas.org/2017/09/13/catching-up-with-runaway-hot-plates/>.

Hotplate Best Practices:

It is necessary for everyone in a lab setting to be aware of the potential for problems when using hotplates. Always observe the “Best Practices” below:

- **Engineering controls: Utilize Intrinsically Safer Technologies**
 - Utilize Hotplates or heating devices with feedback loop and/or over-temperature protection.
 - Avoid combination plates if possible. If only stirring is needed, purchase plate with stirring function only.
- **Administrative Controls: Change the Way you Work**
 - **Disable hotplates when not in use.** Unplug hot plates or use a switchable power strip or power supply.
 - Perform heating functions only when personnel are present and monitoring heating.
 - Discontinue using and replace all hotplates known to be malfunctioning (see list on next page).
 - Replace all hot plates manufactured prior to 1984.
 - Keep hot plates in good condition. Do not attempt to repair any hot plate.
 - Keep flammable solvents 2 feet away from hot plates, even when not in use.
 - Keep plastic, paper, cardboard, etc. at least 6 inches away from hot plates.
 - Clear shared workspaces of equipment and reagents when a procedure is finished.

Malfunctioning Hotplates

The NDSU Safety Office requires that labs immediately discontinue using hotplates listed in the table below. These hotplates may have been a source of laboratory fires at universities and national labs across the country. Contact the Safety Office to dispose of all hotplates in your laboratory that are listed below.

Brand	Model	Spontaneous Heating	Runaway Heating	Other/Notes
Corning	PC-35	X		No temperature feedback.
	PC-351	X		No temperature feedback.
	PC-200			"Off" does not disconnect power from heating element.
	PC-220		X	"Off" does not disconnect power from heating element.
	PC-320	X		
	PC-400D	X		
	PC-420		X	"Off" does not disconnect power from heating element.
	PC-420D	X	X	"Off" does not disconnect power from heating element.
VWR	7x7 Aluminum top	X		
Troemner	97042-714 Professional Ceramic 7x7 97042-642 Advanced Ceramic 7x7			[University]** evaluated 2 of their Troemner hot plates and found safety hazards based on the design and manufacturing practices.
Fisher	Isotemp 11- 600-49H/ 11-700-49H			"Off" does not disconnect power from heating element.
Chemglass	Optimag-St CG-1994-10/ CG-1994-50 / CG-1993-T-50	X		[University]** electronics tech verified that this model heated to 300 within a min even though it was off
Cimarec*	SP46925	X		No temperature feedback.
	H-4954.xx		X	
* Sold under Thermolyne, Barnstead/Thermolyne, and Fisher names depending on age.				
IKA				plate can error out easily and these plates have a tendency to overshoot when heating.

**See additional notes and references on next page.

Notes:

- ** A world-class university who heard about our fire, contacted us, and generously shared this information.
- The above list is not exhaustive or comprehensive. There likely are other hotplates that could be prone to uncontrolled heating as well as ANY hotplate that has not been properly cared for.
- Exposure to elements such as cold, moisture, corrosive gas and vapor are known to increase the chance of processor failures, although problems have also been observed in nearly new equipment.
- Hot plates manufactured prior to 1984 do not have temperature feedback controls and can spontaneously and rapidly heat beyond the set temperature while in the 'ON' position.
- Stir-only plates may generate heat and even overheat and cause fires while stirring viscous liquids or mixtures with solids due to under-powered motors.

References:

- <https://dchas.org/wp-content/uploads/2017/09/RunawayHotPlates-2017Aug.pdf>
- http://www.ehrs.upenn.edu/programs/labsafety/alerts/hot_plate_malfunction.html
- <https://scholarblogs.emory.edu/ranews/files/2015/12/0515LabRatNews.pdf>
- <https://www.safety.duke.edu/news-events/hazard-alert-laboratory-hotplate-fires>

For more information, contact the NDSU Safety Office at 701-231-7759 or send an email to bret.mayo@ndus.edu.