

# Pasadena Citizens' Advisory Council

## Flaring 101: An Overview

September 24, 2024

From the history of the first flares being ignited by flying arrows to today's depressuring systems, Tim Weber, from Chevron's Technical Center, gave the PCAC a deeper understanding of these pollution-control safety systems that are used in some PCAC plants. Weber, who shares his expertise on flares with the American Petroleum Institute, has 25 years of experience in the petrochemical field and 15 years of experience in leak system and flare design.

Weber told the PCAC that flares are in place for a purpose and are not intended for use all the time. Flares are primarily safety systems that are used to relieve pressure in an upset, for example. They are used when you take pressurized equipment out of service to clear out the contents before maintenance or during startup until the product meets specifications. They are most common in facilities processing hydrocarbons. The gases come from various sources in a plant. They go into the purge-gas system and to a knock-out drum where any liquids in the purge gas are collected in the drum so that only the gases are sent up the flare stack to be combusted. Weber went on to explain that there will always be a flame on a flare, similar to the pilot light on your stove or water heater. When sensors detect a vapor traveling through the flare stack, the pilot light will ignite the vapor to combust it and thus prevent all of the release from venting to the atmosphere. Typically, 98% of the vapors are destroyed. The PCAC also learned:

- Flares date back to the 1920s, a time when flares did not have pilot lights, and "flare lighters" would shoot arrows at the tip to light the flame. Flare guns also have been used to light them.
- Flares can be assisted or non-assisted. Assisted flares use a catalyst, such as steam, oxygen, or pressure to improve the efficiency of the combustion.
- The size, intensity, and color of the flame is determined by how much and what kind of gas is flowing into the flare stack – more gas, the bigger and brighter the flame will be.
- It's very difficult to achieve 100% efficiency with flares, although, some will perform better than 98%. Destruction efficiency is the percentage of the gas that is sent to the flare that is combusted into carbon dioxide and water, primarily.
- Ground flares are like a field of Bunson burners – a lot of smaller flames – and can be the size of football fields. They are hidden by fences, so the flames are not usually visible from ground level. The reflection of the flame might be seen.
- Video cameras are used to determine whether the mixture in an assisted flare is properly balanced. Artificial Intelligence (AI) can be programmed to recognize and interpret the appearance of the flame from the video feed and take smoke readings. AI can monitor 24/7 whereas a person might not be able to monitor the video feed as efficiently.