

## HAZOP

### Safety statement

Safety is always an important factor when dealing with machinery and chemicals. It is vital to identify all potential hazards in order to prevent accidents from occurring and to protect employees. Exposure to extreme high pressures and temperatures should always be a main priority when dealing with an industrial process. There should always be a safety protocol in case of accidents, such as explosions. First and foremost, the high temperatures present hazards to the equipment and workers. The materials of construction become a serious consideration in everything from the piping to the reactors and heaters.

The fluidized bed reactor for pyrolysis technology deals with temperatures between 550°C to 600°C. The boiler and any pipe transporting the steam are under extreme temperatures that could easily scald. Hence, the lab must have thick Kaowool insulation. The biggest hazard from these pieces of equipment is in the form of leaks, which could release hot fluids. The pumps can overheat and can cause severe burns if they are used for extended periods of time and are not properly maintained. If overheating occurs, the pumps should be temporarily turned off and allowed to cool back to the proper operating temperature.

There is a possibility of injury while operating the process equipment. Because of the safety hazards associated with handling machinery such as physical separators, everyone should be properly trained before operating. If there is a reaction with the bio-oil and the fluidized bed reactor, corrosion could occur and fuel may leak out, which poses a large fire hazard (Cloutier and Cushmac 252). It is recommended the inside of the reactor wall line with polyethylene. It is recommended that the syngas vessel to be stored at a safe distance away.