Industrial Management of Fuel Impurities
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About UOP

For nearly 100 years, UOP has been the leading international supplier and licensor for the petroleum refining, gas processing, petrochemical production and major manufacturing industries.

As a respected pioneer, we are responsible for developing and implementing some of the most useful, original technologies in the world.
Producing Commercial Grade Fuels

- Commercial grade fuels typically have regulatory specifications
- Natural gas and diesel must meet specs to go into product pipelines
- Product impurity specs vary geographically
  - $\text{CO}_2$, sulfur species and odorant levels in natural gas
  - Level of sulfur in diesel
- Production of commercial grade fuels is well understood and there are many technology providers worldwide
- Hydrogen production technology will influence fuel selection
Production of Hydrogen

- **Reforming**
  - Used to transform a fuel with a high H/C ratio into a hydrogen stream and a stream with a lower H/C ratio
  - Use group VIII metal catalysts that are deactivated by sulfur
  - Sulfur speciation depends on fuel source

- **Natural Gas (Steam – Methane) Reforming**
  - Reduction sulfur beyond pipeline NG spec is needed
  - Technology exists and readily available
  - Adsorbents
    - Activated alumina, 13X commonly used in NG purification
    - ZnO and other adsorbents used to remove sulfur at high temperature
Hydrogen Purification for Fuel Cells

- Steam-Methane reforming results in the production of CO as well as hydrogen
- CO is a big poison for fuel cells
- Hydrogen purification
  - PSA is used to remove CO, CO$_2$, and N$_2$ from H$_2$
  - UOP is one of the world leaders in Hydrogen PSA
  - Selective oxidation of CO to CO$_2$ is another means of removing CO
- Sulfur is typically not a problem because the reforming catalyst will usually scavenge sulfur containing species