CATnap™
Catalyst Passivation Process

An Alternative to Inert Entry
Cat Tech is pleased to present the CATnap® Catalyst Passivation Process - an exclusive, patented technique for unloading catalysts from petroleum processing units. CATnap technology passivates pyrophoric or self-heating catalysts by the application of a proprietary CATnap catalyst coating chemical. The catalyst surfaces (and equipment surfaces) are coated with an organic film which retards oxygen penetration and reaction. The passivated catalyst can be unloaded under air, thus eliminating many of the hazards and expenses related to inert entry.

This passivating effect is demonstrated in Figure 1. The blue line shows the heat release of a spent Co/Mo catalyst as it is gradually heated in air to 400°C. The catalyst starts heating up at about 120°C when the metal sulphides begin to oxidize. A second reaction representing the carbon burn commences around 300°C. Once the catalyst is passivated by the CATnap process (red line), the catalyst is stable to about 300°C.

Application of the CATnap technology involves the injection and adsorption of a chemical inhibitor. Often, this procedure is a departure from the norm because the unit is partially cooled under oil. Although the details of the procedure must be customized for each application, a generalized procedure is outlined in Figure 2. Initially, the feed rate is reduced while the reactor starts cooling down. When the unit is below reaction temperatures, a carrier oil of prescribed viscosity and other properties is introduced to displace the normal process feed. Once the feed oil is flushed out, the carrier oil is put on total recycle and the CATnap catalyst coating chemical is injected. The unit is then cooled to a target temperature (typically 140 - 150°C). Oil flow is discontinued and the reactor is further cooled under flowing gas. At this point the unit may require evacuation or purging to reach permissible entry limits for H₂S, S₂O, LEL, CO and Ni(CO)₄. The working area is then flushed with air and the catalyst is unloaded by conventional techniques.

The benefits of the CATnap process are clear: Improved Safety, Time Savings, Reduced Costs, and Intangibles. These are outlined on the opposite page.

Clearly the most important feature of CATnap technology is that it eliminates the life threatening nature of working in a nitrogen atmosphere. In spite of this, reactor entry technicians (RET's) are outfitted with full life support equipment. Safety is further enhanced by handling passivated catalyst and minimizing the hazardous dust normally present with catalysts removal.

Experience has shown that significant time can be saved with the CATnap process. Elimination of a hot H₂ strip and cooling down with liquid circulation can significantly reduce shutdown time. Also, the equipment and procedures used with CATnap technology can reduce the actual unloading time.

The time savings and other features can provide substantial cost savings. The expense of nitrogen for inert entry is significantly reduced or eliminated. Many associated costs, such as equipment rental and contract labour, are reduced due to the shortened turnaround time. Probably the most significant value to the refiner is having his unit back on stream quicker and minimizing production losses.

Intangible benefits are difficult to quantify but are, nevertheless, very important. Clearly, not having to deal with a life threatening environment increases morale, productivity, and quality. A cleaner, safer operation means less complications and distractions for all personnel.

Another important feature of CATnap technology is that the catalyst is fully regenerable. A variety of hydrotreating and hydrocracking catalysts have been tested and qualified through laboratory studies and commercial runs.

Cat Tech is proud to bring CATnap technology to the refining community. We feel it offers a major breakthrough in catalyst unloading technology and sets a new standard for safety in the industry. If you would like to learn more about CATnap, please contact your Cat Tech representative, call our office at +44 1724 871747 or visit our website at www.cat-tech.com.
CATnap® Process Advantages

SAFETY
- Non-life-threatening atmosphere for catalyst removal
- Suppresses self-heating or pyrophoric tendencies of catalysts
- Reduces hazard of handling, transportation, and storage
- Minimizes dust emissions
- Working in a dust-free environment

TIME SAVINGS
- Eliminates hot H₂ stripping step
- Faster cooling with liquid
- Reduced catalyst vacuuming time
- Eliminates time to clean/change bag filters

COST REDUCTION
- Time value of unit (critical path)
- Reduces equipment rental time (crane, etc.)
- Reduces contract labour
- Eliminates energy cost for hot H₂ strip
- Reduces (eliminates) cost of nitrogen for inert entry
- Reduces environmental risk
- Reduces the possibility of accidents
- Reduces risk of adverse public relations in case of incident

INTANGIBLES
- Improved morale of reactor entry technicians, supervisors, and refinery personnel
- Improved quality and productivity - people concentrate on doing their job rather than the stress and worrying about working in an inert atmosphere
- Fewer distractions for refinery management
- Cleaner operations
- Allows refinery supervision to pursue other tasks

REGENERATION
- Catalysts are fully regenerate
Catalyst treated by CATnap Catalyst Coating Chemical

*Delta Temperature vs. Temperature*

(Figure 1)

CATnap Passivation Process

*Application of CATnap*

(Figure 2)