

## Reforming The Future

By Sunil Phansalker, Criterion Catalysts & Technologies

**R**efiners looking for low cost solutions to achieve the Tier 2 gasoline specifications can turn to Criterion Catalysts and Technologies for help. Criterion has developed a wide range of high performance catalysts and technologies that provide additional options to meet future demand for the new fuel. With its extensive experience and technology portfolio, Criterion can optimize the naphtha hydrotreating and reforming system for each refinery situation. This approach enables the entire reforming section to make a greater contribution to the refiner's clean fuels production strategy. Employing innovative catalyst to extract more octane barrels and hydrogen from the reforming assets can trim the investment needed for Tier 2 compliance and help refiners make more money now.

U.S. refiners produce about 30% of the world's 16 million barrels per day of hydrotreated naphtha. Much of this production is fed to reformers to make

high-octane gasoline blending feedstocks. To improve margins, U.S. refineries are processing more and more heavy

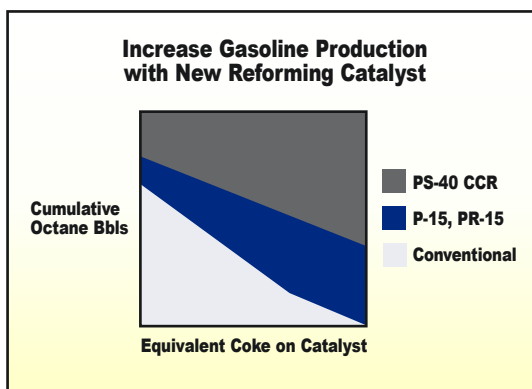
crudes, predominantly from Mexico and Venezuela. As a result, the naphtha hydrotreater and reformer must have the capacity to process the greater percentages of cracked naphtha derived from these crudes.

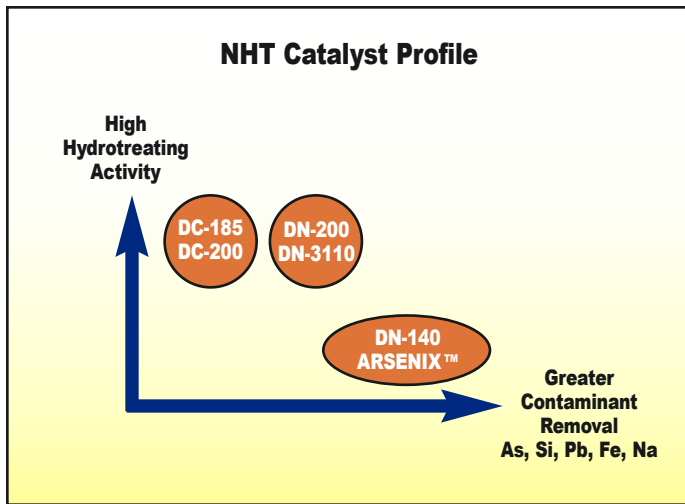
The high levels of contaminants, sulfur and nitrogen in these feeds present major challenges for refiners and catalyst suppliers.

Criterion has developed a suite of hydrotreating catalysts to effectively deal with the wide variety of naphtha feed qualities. Criterion's DC-185 and DC-200 cobalt-molybdenum catalysts offer the highest sulfur removal activity for naphtha feeds at low fill cost. For low nitrogen feeds, these catalysts give excellent protection for the reforming catalyst while minimizing operating costs. DN-200 and CENTINEL DN-3110, Criterion's high performance, nickel-molybdenum catalysts, provide maximum nitrogen removal to prevent interference with the reforming catalyst's isomerization function. Used in combination with DC-185 or DC-200, they give refiners the ability to handle high percentages of coker naphtha without jeopardizing the reformer operation. Since delayed coker naphtha is notorious for poisoning hydrotreating catalysts with silica, Criterion invented a dual function catalyst for this application.

While some catalysts simply adsorb the silica and have little impact on the sulfur and nitrogen in the feed, Criterion's DN-140 catalyst has been optimized to provide exceptional hydrotreating activity and silica uptake. This combination expands the available hydrotreating volume and protects the downstream catalysts against silica contamination.

Continuing its innovation, Criterion has recently introduced ARSENIX™, the first arsenic trap that is also effective for sulfur and nitrogen removal. This catalyst should help refiners on the West Coast who are processing crudes with high arsenic levels and refiners who are processing Canadian synthetic crudes.





Downstream, Criterion has also made significant catalyst advancements to create more options for refiners. From semi-regen to moving bed (continuous catalyst regeneration) reformers, Criterion's catalyst improvements are extending the unit's

capabilities. Its newest reforming catalysts, the P15/PR15 Series (fixed bed catalysts) and PS-40 (CCR catalyst), increased the average C5+ yield as much as 2 weight percent, thereby substantially increasing the reformate octane barrels. Additionally, through its synergetic alumina research programs, Criterion has developed reforming catalysts with lower coking rates to squeeze more gasoline from many reformers.

Applying these catalyst systems probably won't circumvent the need for grassroots investments for Tier 2. However, Criterion has found that these quick, reliable options can often reshape the investment plan to yield a more attractive return. Commercial experience proves the right combination of catalysts can enable refiners to significantly reduce operating costs, expand the crude mix capability and generate valuable gains in the reformer's performance without capital investment.