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## **Question 48: Discuss recent advances in reforming catalyst technology. What performance improvements are being researched?**

**DUBIN** (Axens North America)

The most current catalysts on the market are multi-promoted using a number of different promoters beyond the base platinum-rhenium or platinum-tin. It is not a one-size-fits-all market, so there are tailored designs for different needs. For CCRs, the current drive is for improved yields. Units are often octane-long. The goal is now to maximize barrels as best as we can. We can then try to contrast to the early 2000s where gasoline was high in demand and high activity.

Moving-bed catalysts were desired to keep coke make down or within the design parameters of the existing unit. For fixed-bed units, we are now seeing the drive towards increased stability. Refiners are trying to push the time between regenerations as long as possible. The economic incentive to stay onstream is bigger than the extra octane barrels or liquid volume product derived from a different type of catalyst.

**JOE ZMICH** (UOP, A Honeywell Company)

UOP is always looking to improve the catalyst performance; not only activity, meaning lower reactor inlet temperatures for desired octane, but also higher reformate production. In the North American market, it becomes a little more complicated with reformers intending to operate at much lower octane. As octane is decreased, the paraffin conversion in the reactor system will go down. You will then be relying on differentiation of naphthene, specifically C5-ring naphthene conversion. It is more difficult to differentiate catalysts at low paraffin conversion.

**DUBIN** (Axens North America)

The newest generation of reforming catalysts is multi-promoted using a number of different metals beyond the base platinum and rhenium or tin. These promoters are being used to tailor the operation to fit exactly what the refiner needs, as opposed to a one size fits all market.

The current market drive for continuously regenerated catalyst is for increased yields. As the overall gasoline market stagnates, refiners have been looking to recover as many barrels as possible from their units while operating at reduced severity. Many refiners are octane long, reducing the need for high activity catalysts. This is a big change from the early 2000s when refiners were looking to maximize gasoline octane out of their continuously regenerated reformers, requiring high activity catalyst to keep coke within the design range on their unit.

For the semi-regeneration market, the driver has been towards increased stability.

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Refiners are trying to maximize their time on stream, using the reduced coke make in the current generation of semi-regenerative catalysts to stretch the time between regenerations. The savings, obtained by staying on stream, are often a bigger driver than extra octane barrels or hydrogen.

**SUBHASH SINGHAL** (Kuwait National Petroleum Company)

There are continuous advancements in catalyst systems for increased cycle length and product selectivity. Performance improvement – in terms of high octane, high H<sub>2</sub> rich gas, high LPG, and less fuel gas – are important to researchers.

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