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**Question 103: We increased reactor severity and noticed an increase in oxygenates in LPG and sour water. Can you explain the mechanism by which phenols and other oxygenates form in the riser?**

**Kenneth Bryden** (Grace Catalysts Technologies)

While you would expect oxygen to mostly react with hydrogen to form water in a riser, some oxygenates do form.

Phenols and other oxygenates can form in the riser via two mechanisms-

- Cracking of molecules in the feed that naturally contain oxygen bonded to the aromatic structures (for example: phenols, benzofuranes and quinolones)
- Reaction of extraneous molecular oxygen with hydrocarbons in the riser.

Sources of extraneous molecular oxygen in the riser include:

- oxygen carryover that is entrained in the catalyst from the regenerator
- oxygen from using air as the aeration media for the regenerator standpipe
- air entrained or dissolved in the feedstock

Since increasing reactor severity will result in an increase in catalyst circulation, it is likely that the increased oxygenate production being observed is from the higher catalyst circulation which is increasing the entrained molecular oxygen carryover to the riser.

The responses to question 106 at the 2006 NPRA Q&A and Technology Forum and question 91 from 2013 AFPM Q&A and Technology Forum contain additional information on this topic.

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