

3.3 Shell ICP - Shale Oil Refining

Vijay Nair, [Guus Roes](#), Robert Ryan

Shell E&P Co., Houston, TX, United States

The characteristics of Colorado shale oil/water/gas produced from Shell's In-situ Conversion Process (ICP) technology are compared to those of conventional crude, with emphasis on properties that affect treating and refining. ICP shale oil is distinguished by the absence of residuum, with high nitrogen but low sulfur and presence of particulates that promote fouling. Shale gas has carbon dioxide, olefins and C₂ + species, whereas shale water has significant amounts of ammonia. The nature of ICP shale oil is generally paraffinic with presence of saturated rings (naphthenes). Extensive pilot plant studies were carried out to assess processability and the general finding is that conventional refining processes, with some modifications or tweaks, can be used to refine the shale oil to marketable transportation fuels. While the kerosene and diesel fractions can be refined to excellent middle distillates, the paraffinic naphtha fraction, after hydrotreating, does pose difficulty to being reformed into high octane gasoline. The production of alkylates helps to boost the overall octane of the gasoline pool. The hydrotreated naphtha and vacuum gasoil are excellent feedstocks for the manufacture of lower olefins for the Chemicals industry.