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Planning Natural Gas Operations

Presently economic luster of natural gas (NG) is dimmed by slackened demand overshadowed by excess capacity. In Canada & the US NG's Btu-equivalent price has slumped to less than $25/bbl. Thus, soundly financed companies have squeezed NG investment while leveraged explorationists are riding out a life-or-death struggle. Elsewhere, NG's price-tie to oil supports a more limited restraint.

Nevertheless, certainty calls from the gloom, "This too shall pass." The greenness halo over 'clean' NG with its maximal H/C ratio propels its use. Oil exporting countries can preserve the 'golden-egg laying goose' by using NG for their prodigious power needs. NGL and gas-to-liquid plants provide growing consumer access. BP World Energy 2009 shows NG reserves (6534 TCF) equivalent to oil (1258 BBbl). With exploration's focus – plus new tech a la shale gas – NG will expand.

Since its incorporation 30 years ago, Maraco has evolved a suite of software spanning NG exploration, development, and production. Our GORE (GasOilReserveEstimate) is tailored to address the explorationists key question, "How big is my find?" Using Q & P from a production test GORE estimates GIP & decline fraction -- and, given price & well cost, payout time for the next well. Updates with the latest observations provide the earliest guide to 'What next?'

GMAN.OPT simulates NG reservoir/surface flow while determining an optimal schedule of wells & compressors that stretches a plateau rate through time. Each addition to the schedule is the well/compressor that now has the highest return (PVR). Development stops -- and decline begins -- when PVR of all additional candidates is below cutoff. Experience has shown us that case-study schedules contain sub-standard investments. Years ago, a development plan prepared by a competent consultant – commissioned by client management as a check on OPT -- carried 25% higher cost for the same rate profile. When price of liquids collapsed in 1986, this client eliminated 1/3 of budgeted wells in a two-week evaluation.

Maraco's GOMAN replaces OPT when

Detailed economic tables -- revenue, cost, return – are needed,

Surface processing unit capacities -- separators, sales gas, sulfur, NGL plants – and product compositions need detailing,

Number of reservoirs becomes large. Largest current application has 70+ reservoirs.

GOMAN also can integrate combined crude oil and associated & non-associated gas complexes -- which is now being done for Aramco & Kuwait Oil Co.

Finally, our GasPal system provides the most advanced nodal analysis NG planning tool available today. GasPal's core program calculates capacity of one or many reservoirs flowing to one or several offtake points. The underlying framework for the model's reservoirs is wells in place or scheduled vs time (and for layered formations perforation and plug dates or flow condition) and compressors dated-in at specified surface-network nodes. From capacity, GasPal determines production schedule with specified spare capacity pursuant to a requested rate profile. Aquifer influx, relative permeability, and gas trapped are accounted for. Elaborate graphics support history matching and performance interpretation.

Auxiliary programs are:

UPSCLR -- upscales a Petrel geologic model into a GasPal computing grid via an onscreen interface,

GRIDDER – generates a computing grid onscreen overlaying a reservoir's contour map,

TFR (TubingFlowlineRiser) history matches well/flowline performance using a collection of correlations.

A single reservoir model can be built and onstream in one hour (with run time for 360 months of 1-2 seconds). Large models requiring extensive history matching take longer. TOTAL's Tunu Field model – 23 platforms, 700+ wells – development and validation stretched over several months. Similarly, for EBN's (Dutch Govt) model of the Groningen Field. Here, wells produce into a ring of pipe. As regional demand shifts, gas-flow direction in the ring changes. GasPal is the only commercially available software that dynamically calculates such flow reversals in a pipe loop.

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