MRT @workflow

1. Collect urface flowrates $\{q_O(t), q_G(t), q_W(t)\}$ and bottom-hole pressure (BHP) $p_g(t)$ which are normally available with permanent downhole gauges (PDG)
2. Data filtering
    a. Filter the BHP $p_g(t)$ data for overshoots
    b. Filter the BHP data with wavelet thresholding to reduce the noise
    c. Decimate the BHP data (usually 10:1 or 100:1)
    d. Translate the Surface flowrates $\{q_O(t), q_G(t), q_W(t)\}$ to Total sandface flowrate $q_t(t)$ with account of BHP $p_g(t)$ at any moment of time
    e. Synchronise total flowrate q_t variations with BHP variations
    f. Create multi-well history plot with q_t, BHP, Y_w, GOR/Rs.
3. Primary Analysis
    a. Filter out shut-ins and hold drawdowns only
    b. Create material balance (BHP and Pe vs cum Q) and IPR (BHP vs q_t) diagnostic metrics over the drawdown history
    c. Identify the zones of constant productivity index (PI = const), Steady-states (SS) and pseudo steady-states (PSS)
    d. Assess dynamic drainage volume V_e for all wells – this is a volume which well is currently draining with account of interference with other wells
4. Deconvolution
    a. Select the constant Productivity Index time segments
    b. Remove pressure data during shut-in periods except possibly few valuable (representative and similar to drawdown)
    c. Process PBUs to assess formation pressures
    d. Input formation pressure P_e as constrains for future deconvolution
    e. Tune up the weights to match deconvolution trials with PBUs against DTRs
    f. In case of wells are sitting in the same homogenous reservoir compartment with no behind-casing complications then assume CTR are symmetric to further constrain deconvolution
    g. Perform multiwell deconvolution and QC
    h. Analyse the response and separate wells by non-interfering groups
    i. Repeat multiwell deconvolution for each well group and each constant PI time period
5. Convolution and analysis
    a. Reconstruct formation pressure P_e history
    b. Reconstruct productivity index history
    c. Validate if PI is constant and repeat deconvolution exercises over various time intervals if required
    d. Analyse rates correction and check if it is within the metrological limits and raise allocation concerns and /or advise the corrections
    e. Create unit-rate spider-plot – a pressure impact diagram showing how one well with unit-rate would be varying the pressure in another well over time
    f. Create historical rates spider-plot – a pressure impact diagram showing how one well was varying the pressure in another well over time
    g. Create historical rates pressure interference map showing a current and cumulative impact from one well on another
    h. Create oil IPR at different formation pressure markups and analyse production optimisation potentials
6. Analytical modelling
    a. Perform analytical pressure diffusion modelling of all DTR/CTR wit conventional Pressure Transient Analysis (PTA) using log-derivative log-log plots
    b. Assess potential drainage volume $V_{e,max}$ for all wells – the volumes which well would be draining in case it would be the inly producing well in the field
    c. Assess well drainage transmissibility and cross-well transmissibility and compare them against each other and against the OH log interpretation on the map
    d. Analyse additional diffusion model parameters (skin-factor, fracture length, horizontal length, permeability anisotropy) against expectations
7. Additional studies
    a. Production forecasts

   i. Generate formation pressure and bottom-hole pressure forecasts based on NFA production /injection rates
   ii. Generate formation pressure and production forecasts based on constant BHP
   iii. Additional forecasts based on various BHP and production scenarios

b. Numerical pressure tests
   i. Create N^2 numerical pressure test scenarios for each DTR and CTR
   ii. Check simulated DTR/CTR against deconvolved DTR/CTR in log-derivative diagnostic plots to understand where exactly numerical model may have discrepancies
   iii. Try various model boundaries, barriers and reservoir properties to improve the match

See Also

Petroleum Industry / Upstream / Production / Subsurface Production / Field Study & Modelling / Production Analysis / Multiwell Retrospective Testing (MRT)