Paraffin Removal

From several projects focused on removing and preventing paraffin downhole and in surface flow lines, the following basics steps are offered.

1. Paraffin Solvents - best universal solvents were xylene based materials with at least 20% of high quality xylene (bp 138 to 144C). Toluene was also good but the -40C/F flash point is a hazard. Xylene flash point is 85 to 110F (29 to 43C) depending on the form (ortho, meta or para). 50/50 xylene and diesel is an OK solvent. Poorest solvents were hot oil (it's loaded with paraffin in most cases from re-use), diesel (avoid #2 diesel unless mixed with xylene) and some naphthas. "Xylene bottoms" are too variable to predict from batch to batch - not recommended. If you cannot use xylene, suggested solvents are clean kerosene (test first), kersoene with a dispersant suited to the particular paraffin and #1 diesel (not great but usable). Condensates, light crudes (>35 API), gasoline (!), butanes and propanes have been used as paraffin solvents but the flash point makes them dangerous and unpredictable.

2. Asphaltene solvents - if the paraffin contains a significant amount of asphaltene (3 to 10%+), you propably will need a solvent with xylene for complete cleaning. An environmental acceptable solvent is lemonoil (not a typo), but it's much less effective than xylene.

3. Dispersants - some surfactants (dispersants, soaps, cleaners, degreasers, etc.) are effective, but only on some paraffins and at VERY specific conditions. Individual tests at conditions as close to field as possible are needed and then take the two or three best and field test.

4. Bacteria - the use of pseudomonis and ultramonis and related strains of bacterial injected into the sump and pumped back can prevent paraffin and very slowly remove paraffin, however, they are best in very low rate (<500 bbl/day) wells without a packer with BHT of less than 200F / 93C. We have run extended multi-field trials and has applications experience if you need it. There are all kinds of reports out there on bacteria performance, most are garbage. This does not appear to be a good fit here.

5. Magnets - several trials with controls, not one successful.

6. Hot oil - shallow use in most applications since the standard down tubing and up the annulus flow is a shell and tube heat exchanger. Again - we have documented field trials with downhole temperature probes. You cannot circulate and get heat deep - most effect is simply from pressuring up on the well. You can get heat deep by bullheading but the hot oils were tested were very detrimental on the formation damage side.

7. Hot water - hot water with a dispersant has been used and found to be successful, however, maintaining the heat is a criteria to prevent redeposition. Must keep temp over 130F / 54C

8. Jetting - best application of solvents and dispersants are with jetting subs with maximum agitation. Heat is even more important since over 130F / 54C softens most paraffins (<C30) and makes removal easier.

9. Using plastic coated flow lines instead of steel may cut the oil oil frequency. Oxy Petroleum went to plastic flow lines in the Permian Basin and reduced hot oiling from 6 weeks to 6 months plus. The reason is a slicker surface (minor) and the heat flow "k" factor of the plastic is 100 times lower than the steel (major).

If I can help, please let me know.