High Water Cut: Reservoir Problem, Completion Problem, or Both?

Oman field evidence, global analogs and a mechanism-based diagnostic framework

MTI-001 | Technical Insight Series | October 2026

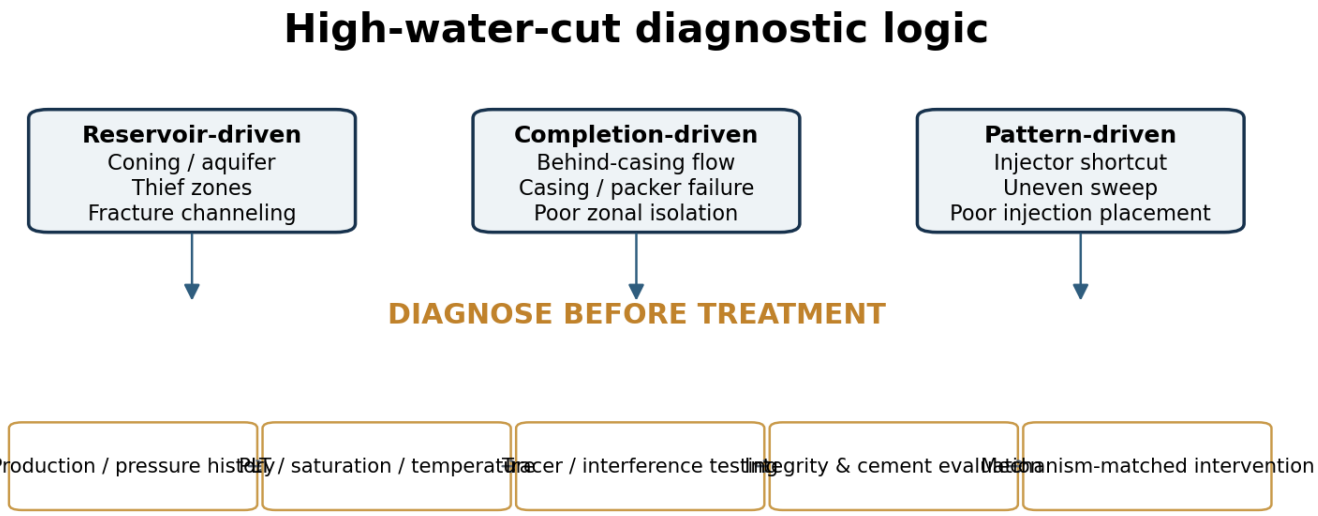
Executive summary

High water cut is an observation, not a diagnosis. In mature fields, excessive water may be driven by reservoir sweep, aquifer movement, fractures or thief zones; by completion and integrity failures; or by the geometry of the injection-production pattern. Published Oman cases show all three mechanisms. Global analogs reinforce the same conclusion: successful water control begins with diagnosis and selective placement, not with a predetermined treatment.

1. Why high water cut is difficult

Two wells with the same 90% water cut can require completely different interventions. A producer connected directly to an injector through a fracture needs a different response from a well with behind-casing flow, bottom-water coning or poor cement isolation. Treating the symptom rather than the mechanism can reduce oil rate, divert water elsewhere or create only temporary benefit.

- Reservoir-driven mechanisms: coning, aquifer encroachment, fractures, thief zones, high-permeability streaks and poor areal or vertical sweep.
- Completion/integrity mechanisms: casing or packer failure, poor cement isolation, behind-casing channeling, crossflow and poorly placed perforations.
- Pattern-driven mechanisms: direct injector-producer communication, uneven injection distribution and induced fractures that connect to natural fracture corridors.



2. Oman examples

Case	Observed mechanism	Response / mitigation	Technical lesson
Yibal - Shuaiba carbonate	Conductive faults, fractures and thief zones accelerated water movement; poor zonal isolation could add behind-casing channeling.	Selective completions, cemented/perforated liners, plug-back and reperforation, PLT-supported optimisation, field-scale voidage management.	Water control required both reservoir understanding and completion architecture.
North Oman Shuaiba-Kharaib carbonate	A tracer/biocide response demonstrated a direct injector-producer shortcut through a fracture system; PLT indicated concentrated injection into a fracture.	Deep fracture shutoff with a penetrating gel, combined with injection-fracture management.	When the problem is reservoir-scale connectivity, a near-wellbore repair alone is insufficient.
Mature viscous-oil field, Oman	Strong aquifer, high-permeability zones/faults and mobility contrast generated very high water cut in horizontal wells.	Compartmentalised autonomous inflow-control completion strategy deployed after field trials.	Where water entry location evolves along long horizontals, autonomous zonal control can reduce dependence on repeated intervention.

3. Global analogs

Region / setting	Water problem	Approach	Transferable lesson
UAE mature carbonate	>90% water cut in a heterogeneous carbonate producer.	Diagnosis with reservoir characterisation and PLT followed by selective chemical water shutoff and post-job monitoring.	Diagnostic quality and placement control are as important as the chemistry.
Offshore Mexico naturally fractured carbonate	Fracture-controlled unwanted water in high-temperature carbonate wells.	Deep polymer-gel water shutoff targeted at conductive fracture systems.	Reservoir-scale chemical isolation can be effective when fracture geometry and

Region / setting	Water problem	Approach	Transferable lesson
			placement are understood.
Kuwait heterogeneous carbonate	Water entry linked to inadequate zonal isolation and later high-water-cut intervals.	Targeted cement squeeze / improved zonal isolation.	Mechanical or cement remediation is appropriate when the dominant failure is completion integrity rather than reservoir sweep.

4. Choosing the mitigation method

Dominant diagnosis	Preferred intervention family	Why
Discrete casing / cement / packer failure	Mechanical isolation or cement repair	Fix the well integrity failure directly.
Known watered-out interval	Selective shutoff, plug-back or reperforation	Removes the offending interval while preserving oil contribution elsewhere.
Direct fracture shortcut	Deep conformance / fracture treatment plus injection control	Acts on the reservoir-scale flow path.
Multiple changing water-entry points along a horizontal	Compartmentalised or autonomous inflow control	Controls unwanted inflow locally as conditions evolve.
Pattern-scale poor sweep	Injection redistribution, conformance and pattern redesign	Corrects the flood rather than treating individual wells repeatedly.

5. Madar technical framework

The preferred sequence is: establish production and injection history; identify the timing and geometry of water entry; test connectivity; verify well integrity; distinguish reservoir from completion mechanisms; quantify economic value; then select the least-complex intervention capable of acting at the correct scale.

Key takeaway

The correct question is not “How do we shut off water?” It is “Where is the water coming from, why is it reaching the well, and at what scale must the intervention act?”

References

1. Yibal V2V Team (2002). Maximizing Yibal's Remaining Value. SPE 77641.
2. Al-Shidhani, S. et al. (1996). Horizontal Wells Rejuvenate the Mature Yibal Field. SPE 37059.
3. Ligthelm, D.J. et al. (2006). Improved Oil Recovery in Fractured Carbonate Reservoirs: Don't Give Induced Fractures a Chance! SPE 98386.
4. Ozkaya, S.I. & Richard, P. (2005). Fractured Reservoir Characterization Using Dynamic Data in a Carbonate Field, Oman. SPE 93312.
5. Fieldwide Application of Autonomous Inflow Control Valve in Increasing Field Recovery in a Mature Field in the Sultanate of Oman. SPE 208179-MS (2021).

6. Lessons Learned from First Application of Polymer Dispersed System Chemical Water Shut-Off Technology in Carbonate Reservoir, UAE. SPE 227316-MS (2025).
7. Successful Water-Shutoff Case Histories in a Naturally Fractured Carbonate Reservoir in Offshore Mexico Using an Organically Crosslinked Polymer System. SPE 127981-MS (2010).
8. Successful Water Shut Off Based on Comprehensive Pre and Post Well Diagnostics. SPE 203307-MS (2020).

Madar Energy Technologies | Global Technology. Local Reservoir Intelligence.