

CATALOG OF TRACER SERVICES & PRODUCTS

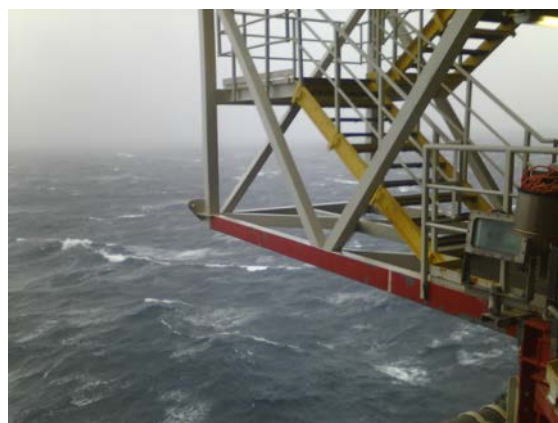
RESTRACK PERFORMS INTEGRATED TRACER SERVICES FOR OIL COMPANIES WORLD-WIDE. OUR SERVICE PORTFOLIO INCLUDE INTER-WELL GAS AND WATER TRACKING, OIL SATURATION MEASUREMENT IN THE NEAR WELL REGION USING THE SINGLE-WELL CHEMICAL TRACER TEST (SWCTT) AND THE INTER-WELL REGION USING THE PARTITIONING INTER-WELL TRACER TEST (PITT).

RESTRACK ALSO OFFER CONSULTING IN ALL KINDS OF TRACER DATA INTERPRETATION, RANGING FROM QUALITY ASSURED RESERVOIR FLOW MAPPING BASED ON FIRST TRACER BREAKTHROUGH TO FULL-FIELD NUMERICAL TRACER SIMULATION USING STATE-OF-THE-ART SIMULATION SOFTWARE. WE USE INDUSTRY STANDARD SIMULATION SOFTWARE, IN ADDITION TO OUR SPECIALIZED IN-HOUSE ARTSIM TRACER SIMULATION SOFTWARE.

INTER-WELL GAS AND WATER FLOW SURVEILLANCE

Inter-well tracer tracking is a proven and efficient technology to map well-to-well communication & heterogeneity. With our 40 unique water tracers and 15 unique gas tracers, Restrack provides the industry's largest portfolio of field-proven well-to-well gas and water tracers to customers. Restrack's gas and water tracers have been field-tested in Norwegian oil fields and applied in tracer projects world-wide.

Restrack delivers complete water and gas surveillance services. Restrack personnel have 20 years of experience in planning and designing water & gas tracer surveys in oil reservoirs, as well as in tracer operations in the field. Our extensive field operations expertise includes on-shore and off-shore oil fields, from the Arctic to Middle-East deserts & tropical conditions. To guarantee a best possible result, Restrack uses proprietary sample preparation & laboratory methodology in combination with ultra-sensitive laboratory equipment. Restrack's laboratory facilities with state-of-the-art instrumentation can handle all kinds of water and gas samples.



Item number	Description	Availability
1	Unique and distinct water tracers	40
2	Unique and distinct gas tracers	15
3	Pneumatic pumps for tracer injection	yes
4	Approved hoses & valves for tracer injection	yes
5	Cat-kit and equipment for gas tracer sampling	yes

NEAR-WELL OIL SATURATION MEASUREMENTS

Knowledge of oil saturation is important to assess the potential for producing additional oil and evaluate the effect of enhanced oil recovery (EOR) methodologies. The so-called single-well chemical tracer test (SWCTT) has been used extensively since its introduction in the early 1970's to measure saturations in-situ. The test exploits the time-lag in back-production of injected esters vs. alcohols generated in-situ by partial hydrolysis of ester, and can measure residual oil saturation in a near-well region up to about 10 m from the wellbore. SWCTTs have been used to establish near-well oil saturation in numerous EOR pilots, such as low-salinity pilots.

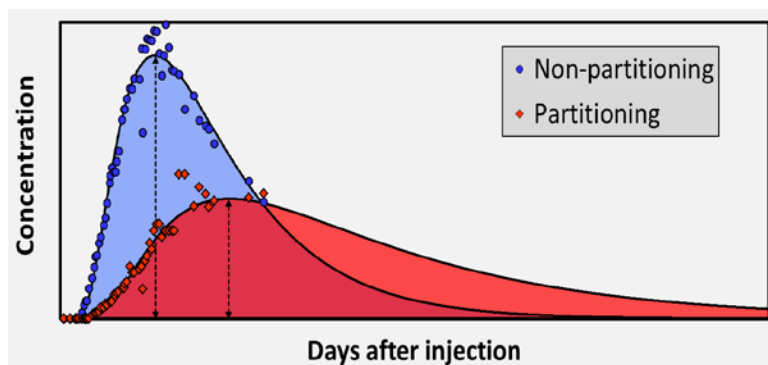
Restrack's SWCTT-experience includes the challenging environments represented by offshore rigs on the Norwegian Continental Shelf, with harsh weather conditions, strict security & environmental regulations and complex well and reservoir conditions. Restrack delivers a complete SWCTT-service, including planning, onsite operation, sampling & measurements, and our personnel take full responsibility of the SWCTT-operation, in close collaboration with operator personnel. Restrack's SWCTT-service include interpretation of SWCTT results. For interpretation of SWCTT-results we have access to state-of-the-art chemical reaction reservoir simulation tools. In addition we use our in-house ARTSim tracer simulator that enables use of industry standard black-oil simulators for SWCTT-simulation.

Item number	Description	Availability
1	On-site analysis instruments	yes
2	Unique and oil/water partitioning tracers	3
3	Pneumatic pumps for tracer injection	yes
4	Approved hoses & valves for tracer injection	yes

INTER-WELL OIL SATURATION MEASUREMENTS

To quantify remaining oil in between wells, and assess field-scale EOR potential, partitioning inter-well tracer tests (PITTs) have been suggested in oil reservoirs. In a PITT, tracers are injected into injectors and sampled in producers. Then a similar time-lag technique as for SWCTTs is used to quantify the oil saturation in the inter-well reservoir volume. Such tests are well-proven and frequently used to investigate the presence and

remediation of non-aqueous phase liquids (NAPLs) in aquifers. Harsh temperature, chemical & microbiological conditions in petroleum reservoirs put severe restrictions on partitioning tracer candidates, and the lack of chemical PITT-tracers with low detection sensitivity, has limited the number of PITTs in oil reservoirs previously. To compensate for this lack, new and stable, oil-water



partitioning tracers suitable for use in PITTs in reservoirs were recently developed and field tested, allowing measurement of remaining oil saturation in inter-well regions. Restrack can therefore as the only tracer service provider deliver inter-well saturation measurements at normal reservoirs' in-situ conditions.

Our portfolio of six unique proprietary chemical PITT-tracers, together with our ordinary water tracers can be used to investigate a range of inter-well regions simultaneously. Our extensive field operations expertise together with proprietary sample preparation & laboratory methodology, and in-house interpretation tools & expertise ensures that a best possible saturation estimate is achieved in the inter-well regions investigated.

Item number	Description	Availability
1	Unique and distinct water tracers	40
2	Unique and distinct oil/water partitioning tracers	6
3	Pneumatic pumps for tracer injection	yes
4	Approved hoses & valves for tracer injection	yes

TRACER INTERPRETATION & INFORMATION ASSIMILATION

Inter-well tracer tracking provides immediate information on injector-producer communication upon first breakthrough of tracer. This zero order information requires little or no interpretation effort. More advanced analytical inter-well tracer interpretation methodology, such as residence time distribution, can provide essential quantitative information on how effective a water or gas flood displaces oil, and reveal flow paths and channels prior to infill-drilling, polymer blocking etc. Similarly, single-well and inter-well saturation estimation using partitioning tracers require adequate interpretation. To realize the full capacity of tracer data and transfer this data into information, assimilation of tracer data with other available reservoir data in a reservoir simulation work-flow is desirable. This requires simulation of tracer transport using existing geological reservoir models and updating reservoir models based on tracer data.



Restrack personnel have extensive experience in all kinds of tracer data interpretation, ranging from quality assured reservoir flow mapping based on first tracer breakthrough to full-field numerical tracer simulation using state-of-the-art simulation software. We can therefore offer tracer data assimilation using a variety of interpretation tools. Restrack personnel have developed in-house methodology that ensures a speedy interpretation of inter-well & single-well partitioning tracer testing to measure saturation. We have also developed residence time distribution tools that can be used to analyse water & gas flooding patterns. Finally, Restrack use the in-house ARTSim tracer

simulation software that can be used in combination with the industry-standard Eclipse reservoir simulator.

Item number	Description	Capability
1	Eclipse reservoir simulation software	yes
2	CMG/Stars reservoir simulation software	yes
3	ARTSim tracer simulation software	yes

TRACER ANALYSIS LABORATORY

Restrack's Tracer Analysis Laboratory has analysed about 50 000 produced water and gas samples from petroleum reservoirs world-wide. The analytical tracer data from all these samples form the basis of any further investigations and reservoir interpretations or simulation studies.

Restrack personnel have developed relevant methods for chemical analysis of petroleum reservoir tracers over a period of 20 years. The developed methods represents today's de-facto industry standard for chemical petroleum tracer analyses. Our experience in methodology development & sample analysis thus ensures the highest possible quality of tracer data sets. Restrack hold a modern laboratory environment equipped with state of the art instrumentation including HPLC, GC/MS and GC/MSMS and is capable to support off-shore and on-shore tracer analyses world-wide. Some of our tracers are even detectable in sub-ppb (part per billion) concentration using on-site analysis techniques.



Item number	Description
1	Water tracer sample capability
2	Gas tracer sample capability
3	Guaranteed detection & quantification limit for water tracers: 50 ppt (part per trillion) or better
4	Guaranteed detection & quantification limit for gas tracers: 1 ppt (part per trillion) or better
5	On-site analysis instruments with guaranteed detection limits of 1 ppb (part per billion) or better