

# **IOR and EOR Terminology Clarifications and Recommendations for the SPE Community**

## **TECHNICAL REPORT**



**Society of Petroleum Engineers**



# **SPE Technical Report**

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## **IOR and EOR Terminology Clarifications and Recommendations for the SPE Community**

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## Summary

Over the past several decades a variety of terms have been used to define the type, timing, and character of techniques that increase recovery. These terms have been used without a definitive recommendation from the Society of Petroleum Engineers (SPE). For this reason, 2024 SPE President Terry Palisch, with the guidance of Technical Directors Rodolfo Camacho (Reservoir) and Hamad Marri (Production), selected a committee of experts to evaluate these terms and provide guidance, clarity, and recommendations to SPE membership.

This paper presents the charter document under which the committee has operated and the results of their discussions. The key elements of the charter are designed to provide recommendations on the following:

1. The relationship of improved oil recovery (IOR) to enhanced oil recovery (EOR).
2. The initial baseline for both IOR and EOR.
3. The relationship of terms primary, secondary, and tertiary to other recovery terms.
4. Refine the classification of recovery technologies that have characteristics that allow them to fall into multiple terms.
5. Provide guidance on how to classify current and future technologies that increase recovery.

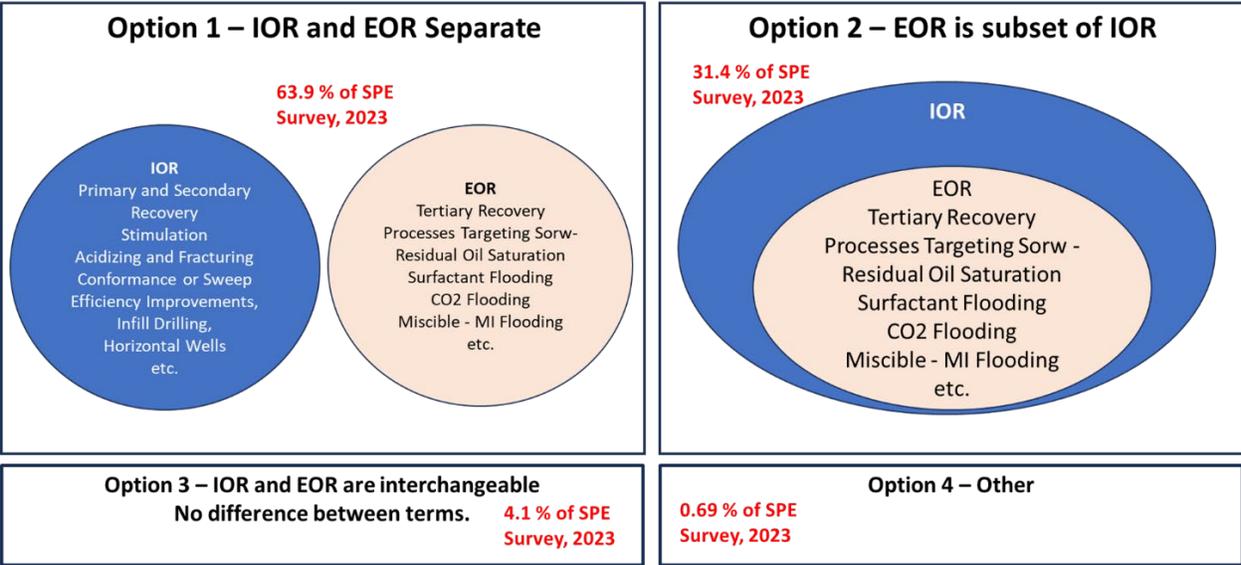
The sole focus of this committee is to provide clarity and a reference point for communication within SPE. The responsibility of the committee, as commissioned by SPE leadership, is to standardize the terminology across the SPE community to improve clarity of communication and terms as they are used in SPE documents, meetings, and any other form of knowledge dissemination activity. To that end, the relationships between IOR, EOR, and a newly introduced term—assisted oil recovery (AOR)—are defined, creating a structure for processes that improve oil production, with IOR as the all-encompassing term for those processes. AOR is introduced as a new term to define those techniques under IOR which assist oil production. These terms provide improved clarity on terminology and accurately define the relationships. We recognize that it will take time and effort to communicate these recommendations across the global SPE community. We ask all SPE members to consider the scrutiny, discussion, and diligent effort that went into formulating the final position on these topics.

Diagrams depicting the relationships are provided to assist our technical community. This includes unconventional assets and how they fit within the recommended terms. We recognize that the choices made will not readily be accepted by all, however, that would be true no matter what choices are made. We respectfully request that the recommendations of this committee be

honored in future SPE documents to improve the clarity of communication within the SPE community.

## Introduction

Over more than four decades a variety of terms have been used to designate oil recovery processes, especially those which extend or increase oil recovery beyond primary oil recovery. Lack of clarity on IOR and EOR terminology is still prevalent within SPE communities. For example, the historic SPE Tulsa conference focusing on IOR and EOR initially started as the SPE Improved Oil Recovery Symposium in 1969, later changed to SPE Enhanced Oil Recovery Symposium in 1980, and again reverted to SPE Improved Oil Recovery Symposium in 1994. Since then, the conference has continued as the SPE Improved Oil Recovery Symposium with the technical program comprising all recovery methods with a focus on EOR. Lake (1989), with a recent update Lake et. al. (2014), provided the definitions of IOR and EOR terms. Taber et al. (1997) presented some discussions on IOR/EOR terminology and highlighted the need to use these terms with their intended technical meanings. Later, a good review of how these terms developed was presented and some of their uses discussed by Stosur et al. (2003). Although this paper did a good job of describing some of the recovery terminology relationships, they stopped short of making a comprehensive recommendation to the SPE community. Instead, they recommended that a committee within SPE be formed to make a clear and concise recommendation of terms. Around that same time, a cochair of the SPE IOR-EOR Technical Interest Group performed an informal survey of the SPE membership and found key differences in the definitions held by a large portion of the general SPE membership compared to what was recommended in the 2003 paper. The recommended SPE committee was never formed, and the Society continued to proceed with a variety of uses for IOR and EOR. In the fall of 2023, a new discussion was posted to the SPE Reservoir and Production Technical Communities, and the R&D Technical Section. This survey was also posted in *JPT*. The readers and community members were asked to vote on how they preferred to use the terms IOR and EOR. They were provided with four possible options: (1) IOR and EOR should be totally separate; (2) EOR should be a subset of IOR; (3) IOR and EOR should be completely interchangeable; and (4) other. The survey was completed by only 169 participants from the roughly 68,000 SPE members registered as of 2023. Although this is not a statistically significant portion of the membership, it is consistent with one earlier informal survey and the results are summarized in **Fig. 1**.



**Fig. 1—SPE 2023 IOR-EOR terminology survey results.**

In summary, 64% chose Option 1—IOR and EOR are totally separate.

31% chose Option 2—EOR is subset of IOR.

4% chose Option 3—IOR and EOR are interchangeable, no difference between terms.

1% chose Option 4—Other.

The percentage of survey readers from different SPE communities were as follows: Reservoir Engineering 41%, Production Engineering 26%, Research and Development 12%, and Other 21%. The majority of SPE members who responded to this survey were from the Reservoir and Production Engineering Communities (67%). Even with this variety of disciplines, the survey results did not vary more than +/- 5%. In addition to the survey, there was a broad discussion that ensued within two SPE Technical Communities and one SPE Technical Section. This broad and active discussion on the topic prompted the initial discussions to form this committee effort.

**Charter Development and Discussion Process**

In response to this discussion, SPE leadership (Terry Palisch, 2024 SPE President; Hamad Marri, Technical Director of Production and Facilities; Rodolfo Camacho, Technical Director Reservoir) decided to commission a team of SPE industry experts to review and make a formal recommendation to the SPE community. A team charter was written and agreed upon by the leadership and a 10-member international committee was selected to provide a good representation of the Society. The charter was separated into three parts to focus the team on key deliverable items. Part 1 consisted of two elements. The principal element of Part 1 was to establish the most appropriate relationship between IOR and EOR. The second was to establish a baseline for each term. Part 2 was to define the criteria for the qualification of methods, techniques, processes, etc., under each category. Part 3 was to establish clear and concise definitions for each recovery term. The final element of the charter was to establish key

expectations of how this committee would deliver the results to the SPE community and to the industry at large. This SPE paper was a primary part of those deliverables.

A majority of the committee members were recommended by the Directors or were selected from the active SPE Connection community discussion members. The committee chairman and the members of the committee are the authors of this paper.

### **Objectives and Procedure**

The primary focus or objective of this effort is to provide the SPE membership with a clear and concise set of recovery terms that can be used to communicate the relationship between the different recovery technologies that are used within our industry. Specifically, this effort is aimed at making recommendations on the following, to benefit SPE readership and the IOR-EOR community: (1) The relationship of IOR to EOR. (2) The initial reference point for both IOR and EOR. (3) The relationship of terms primary, secondary and tertiary to other recovery terms. (4) Refine the classification of recovery technologies that have characteristics that allow them to fall into multiple terms. (5) Provide guidance on how to classify current and future technologies that increase recovery.

After extensive discussion and review of alternative definitions and approaches, the most-widely accepted proposal was to utilize a new term—AOR—to represent those methods and techniques that are under IOR but are not secondary oil recovery or EOR. After several additional weeks of discussion, this compromise was accepted as a practical way of maintaining IOR as a global or overarching term but also providing a terminology that classifies those techniques and methods that assist the recovery process, and which fall outside the realm of secondary oil recovery and EOR. This was a difficult decision for the committee, and it is recognized that the addition of the new term AOR may meet with some resistance. However, the committee also recognized that whatever decision was made in defining these recovery terms, some level of resistance was to be expected as it would require members of our industry to alter the way they use these terms. As a committee, we recognized this limitation and decided to provide a structure that improves the clarity and use of the terms while also maintaining many past elements. Once this was decided, the committee shifted their efforts to providing a clear set of definitions and a terminology relationship diagram to help communicate this new perspective. The remaining material in this paper will provide those clarifying definitions and relationships.

### **IOR, AOR, and EOR Terminology Clarifications and Recommendations for the SPE Community**

Upon reflection, we recognized that secondary oil recovery, EOR, and the methodologies included in the newly defined term AOR all improve oil recovery, through various distinct methods. Thus, we recommend continuing the use of IOR as an umbrella or overarching term that represents all efforts that result in increased recovery beyond that expected from unassisted primary oil recovery. With this in mind, we propose the following definitions:

**Primary Oil Recovery:** The oil recovered by means of unassisted natural depletion-drive mechanisms using conventional vertical wells and completions. Mechanisms include solution-gas drive, fluid expansion, aquifer drive, gas-cap expansion, and/or rock compaction.

**IOR:** The oil recovered by means of all or any processes and techniques beyond the mechanisms defined in primary oil recovery and includes secondary oil recovery, AOR, and EOR.

**Secondary Oil Recovery:** The oil recovered by means of the injection of water into the aquifer/reservoir and/or the injection of produced gas into the gas cap/reservoir for the purpose of pressure maintenance and oil displacement.

**AOR:** The oil recovered by means of techniques and/or operations designed to assist the principal recovery process whether primary, secondary, or EOR. These techniques and/or operational changes do not materially alter the principal recovery mechanisms driving the oil production.

**EOR:** The oil recovered by means of the injection of fluids, materials, biological components, and/or the addition of energy not normally present in the reservoir that are designed to alter the physical and/or chemical properties of the rock and/or resident fluids to enhance oil production.

The committee recommends that we discontinue the use of the term tertiary oil recovery, because it is not necessarily the third field-development strategy used. We discussed changing secondary oil recovery, but this term has a well-established historical definition with no simple alternative. However, tertiary oil recovery and EOR are considered synonymous and, since EOR is more accepted, we recommend eliminating the use of tertiary oil recovery. Our concern is that field development stages or strategies are different than oil recovery terms and using a term like tertiary can confuse the difference. In addition, a field development stage or strategy will typically utilize several oil recovery methods, but the terminology needs to be kept separate. For example, the initial field-development strategy may start with primary oil recovery but that is not always the case. Some field development strategies start with secondary oil recovery or even EOR as is the case in many heavy oil fields or residual oil zones with little to no main oil column above the producing oil/water contact. Another example to consider is unconventional oil-field development. The development strategy for an unconventional oil field still utilizes primary oil recovery drive, but it receives massive assistance from AOR techniques, namely horizontal drilling and fracturing. These techniques assist the principal solution-gas drive recovery mechanism through the development of massive surface-area contact that a fracture creates between the well and the reservoir rock. Thus, the initial field development strategy for unconventional assets is to use primary oil recovery with AOR.

The following recovery terminology diagram (**Fig. 2**) shows the recommended relationships between primary oil recovery, IOR, AOR, secondary oil recovery, and EOR. This diagram concisely shows the relationship between primary oil recovery and IOR techniques. Primary oil recovery includes only the natural drive production without any assistance, addition, or enhancement. It is often, but not always, the first oil recovery mechanism implemented in the field. Oil production is later boosted by the implementation of IOR methodologies. Different colors are used in the diagram to differentiate the recovery processes. AOR techniques (listed in **Fig. 3**) help improve the oil production obtained by the main recovery processes—primary, secondary, or EOR. The arrows shown between AOR and the main oil recovery processes illustrate this relationship.

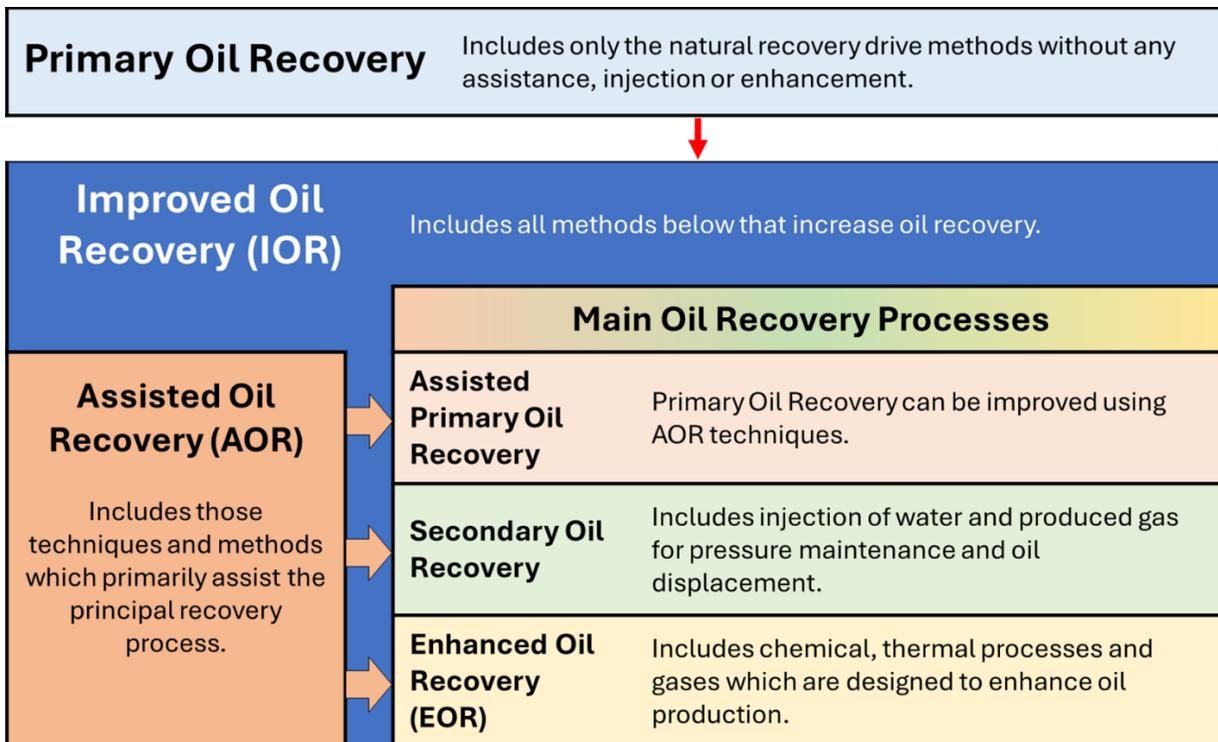


Fig. 2—Recovery relationship diagram.

Another method to refine these relationships and their use is to focus on the methods, techniques, and technologies that are utilized within each of these oil-recovery terms. This is provided in Fig. 3.

Improved Oil Recovery (IOR)						
Assisted Oil Recovery (AOR) <small>can also be applied to Primary Oil Recovery</small>			Main Oil Recovery Processes			
			Secondary Oil Recovery	Enhanced Oil Recovery (EOR)		
Pattern & Fluid Sweep Adjustments	Drilling & Well Intervention	Production Mechanics	Pressure Maintenance	Chemical & Biological Methods	Gas Injection Both Miscible & Immiscible	Thermal & Other Energy
Inj/Prod fluid rebalancing Pattern reorientation Pattern layered down-spacing	Horizontal wells Multilateral wells Slant wells Well stimulation: • acidizing • fracturing Conformance: • water shutoff • gas shutoff	Artificial lift and artificial lift improvements ESP's Plunger lift Rod pumping Gas lift Hydraulic jet pumps	Water injection Produced gas injection Includes all pattern injection flooding	S-Surfactant AS Alkali-Surfactant ASP AS+Polymer Polymer flood Caustic flood Micellar polymer Foam for gas mobility control Microbial Low salinity	Hydrocarbon gas injection CO2 gas injection WAG (water alternating gas) Nitrogen Flue gas	In-situ combustion Steamflooding Hot waterflooding Cyclic steam injection SAGD Steam with foam EM or microwave energy Acoustic wave energy

Fig. 3—Methods, techniques, and technologies associated with each IOR term.

These two figures are designed to help clarify where and how all the various recovery terms fit together.

Some of the oil-recovery processes can be easily classified into EOR and AOR processes. For example, polymer flooding is an EOR process because it improves the mobility ratio of the displacing fluid, thus increasing sweep efficiency throughout the reservoir. Near-wellbore polymer gel treatments are considered an AOR process, because by themselves they do not displace much oil. In fact, most near-wellbore polymer gel treatments primarily displace only water and then plug that area so that the subsequent water displacement fluid is diverted to a different part of the reservoir. This technique clearly falls under AOR. However, other polymer treatments can be more difficult to classify into EOR or AOR. For example, some very large polymer gel treatments that are designed to divert fluid with a principal focus on reservoir-permeability control would clearly remain in AOR. However, other large volume polymer systems (generally not crosslinked) which are designed primarily to influence the mobility ratio of the displacing fluid would be classified as an EOR technique. Bottomline, the classification of AOR vs. EOR when using polymer depends on the intent or primary function of the system. Thus, the use of large volume polymer systems can become a gray area, where it is difficult to pin down the most-important function and thus properly classify as EOR or AOR.

Another example can be CO<sub>2</sub> huff 'n' puff in shale reservoirs. These processes produce oil from the near-fracture region. The oil is solubilized and produced. However, this process does not affect the bulk of the reservoir. Since it enhances oil production within the area contacted but does not assist any other recovery process, it should be classified as an EOR process, not an AOR process.

The committee decided to define a baseline for IOR using historical precedence, that is employing unstimulated wells without artificial lift. This reflects the fact that many innovations throughout the industry's history have resulted in improvements to oil recovery. Further, there was a recognition that IOR should be divided into processes that assist the recovery (AOR) and processes that change the fundamental drive or displacement mechanism, which could be secondary oil recovery or EOR.

Processes that change the drive from primary depletion typically, but not necessarily, proceed through water or produced-gas injection/reinjection, which historically has been defined as secondary recovery, because the injected water yielded a second batch of oil after the field was depleted in primary production (Wilhite 1986, p. 1). These processes improve oil recovery through pressure support (i.e., maintaining or increasing pressure) and through the macroscopic displacement of oil by the injected fluid. Note that because the injected fluids are similar to the native fluids, there is no improvement in the microscopic displacement mechanism over natural aquifer waterdrive.

EOR processes generally improve oil recovery through the injection of substances that are not native to the reservoir. These substances can include one or more of the following: steam, air, oxygen, CO<sub>2</sub>, enriched hydrocarbons, N<sub>2</sub>, surfactants, alkali, polymers, microbial solutions, fresh water, and solutions incorporating nanoparticles; the injection could involve interwell flow or huff 'n' puff processes. As was described in the definition, EOR processes "are designed to alter the physical and/or chemical properties of the rock and/or resident fluids" to enhance displacement efficiency or sweep efficiency from the prior process (frequently a secondary recovery process). The majority of EOR processes fall into thermal, chemical, or solvent categories.

The incremental oil from the secondary and EOR processes is typically evaluated as the increase in oil recovery over that from a trend of the prior process. With secondary recovery, an appropriate approach to defining the increased recovery might include decline curve analysis (semi-log rate vs. time or oil cut vs. cumulative oil production), or by using simulation estimates. EOR processes can result in reduced throughput due to relative permeability changes, as in water-alternating-gas processes or viscosity differences as with polymer, foam, or nanoparticles. Thus, semi-log rate vs. time decline techniques are unlikely to reflect the full incremental EOR oil. Simulation or an oil cut vs.  $N_p$  (or recovery factor), or a dimensionless approach (dimensionless total injection vs. recovery factor) with a recognition of the decrease in throughput (percent of hydrocarbon pore volume injected per year) are recommended.

## **Question and Answer Section**

We recognize that some of these terms are slightly different from past representations. Thus, the next section of this document is designed to anticipate questions and then provide answers.

### **1. Is the purpose of this technical report to classify all current and past technical efforts to increase oil recovery?**

NO, this report was not written to provide a classification for every technique that improves oil recovery. This report is provided so that the community has working definitions and a structure that allows all past, present, and future techniques that improve oil recovery to be properly categorized. We have listed some techniques under categories as examples, but no list is meant to be exhaustive or complete.

### **2. Why is the new term (AOR) needed? How is it going to improve the clarity of IOR and EOR terminology?**

The definition of EOR as stated above is a traditional definition and is well accepted. EOR techniques mobilize oil by basic mechanisms, such as miscibility, interfacial tension reduction, wettability alteration, decrease in mobility ratio, etc. However, oil recovery is improved also by other techniques, including, horizontal wells, hydraulic fracturing, and infill drilling. AOR techniques will not, by themselves, improve recovery. They must be applied to a principal or main recovery drive process like primary, secondary, or EOR. We believe a separate term for these processes will help us to define the differences within IOR. We had two choices—AOR or IOR. Since IOR has been used in the past to refer to all recovery-improving techniques, including EOR, we adopted the term AOR. The introduction of AOR also improves the clarity in IOR and EOR terminology by separating the displacement-based reservoir-scale main oil-recovery processes (secondary recovery and EOR) from the widely used non-displacement-based oil recovery techniques focusing on pattern and fluid sweep adjustments, drilling and well intervention, and production mechanics, which fall under the IOR umbrella term. AOR techniques can be used independent of secondary recovery and EOR to increase or assist recovery during any recovery process, which justifies keeping these methods separate.

### **3. Why is secondary oil recovery classified as IOR?**

Secondary recovery is considered to be an IOR process that involves either injecting water or produced natural gas into the reservoir for pressure maintenance and to displace the oil toward producing wells. The forces used for pressure support/increase and displacement are not natural and they are human induced. Thus, these influences can be viewed as an augmentation of the natural drive mechanisms (Stosur et al. 2003). The fluid injection in secondary oil recovery allows for increased recovery through pressure and fluid displacement. Maximizing sweep efficiency and overall recovery often needs the assistance of AOR techniques. This includes many aspects of custom pattern adjustments, horizontal wells, and inclined or multilateral wells. Waterflooding is by far the most widely practiced secondary oil-recovery method and contributes to more than 50% of oil production worldwide (Baker et al. 2016). Because secondary recovery is a displacement process, it relies on external forces. Secondary oil recovery contributes significantly to global oil production and is classified as IOR.

#### **4. Why are the baseline selections of IOR and EOR different?**

The baseline of any technique or flooding technology must be defined separately based on the economic potential of that development stage. In other words, it serves as the basis for defining the expected incremental recovery from any process. The baseline for IOR is the unassisted natural flowing recovery potential of the reservoir (primary oil recovery). EOR is traditionally based on the incremental recovery achieved beyond that of waterflooding (secondary oil recovery). It is common practice to evaluate the efficiency of EOR processes against the projected recovery potential of waterflooding, which suggests secondary recovery as a suitable baseline for EOR. Where waterflooding is uneconomic, incremental EOR would be based on production above the primary oil-recovery decline trend. Such a baseline for EOR is also consistent with the displacement-based common attributes associated with secondary oil recovery and EOR processes. These baseline selections can be applied at any time and are not linked to oil-recovery stages (primary/secondary or EOR). For example, in reservoirs such as unconventional shales, and heavy oil sands, which have zero natural flowing primary-recovery potential, either AOR or EOR should be implemented as a starting point to unlock the recovery potential.

#### **5. How does the integration of IOR, AOR, and EOR provide better clarity than separating IOR and EOR?**

AOR comprises techniques that help improve the oil production obtained by the main recovery processes—primary, secondary, or EOR. The main objective of EOR is also to improve oil recovery but does so using chemical, biological, gas injection, or thermal techniques to alter the physical and/or chemical properties of the rock and/or resident fluids, as was defined earlier. AOR, secondary oil recovery, and EOR are then, by definition, included under the umbrella of IOR.

With the introduction of AOR, there is no reason to keep IOR and EOR as separate compartments in the classification. Since the intent of EOR is to increase recovery, it naturally falls under or as a subset of IOR.

#### **6. What is the role of AOR in different principal recovery processes?**

AOR includes those techniques and methods which primarily assist the main recovery process—primary, secondary, or EOR. AOR comprises the following techniques:

- Pattern and fluid sweep adjustments
  - Injection/production fluid rebalancing, pattern reorientation, pattern layered down-spacing, etc.
- Drilling and well intervention
  - Horizontal wells, horizontal/multi-lateral wells, slant wells, well stimulation such as well acidizing and fracturing, conformance water and gas shutoff
- Production mechanics
  - Artificial lift and artificial-lift improvements, electrical submersible pumps, plunger lift, rod pumping, gas lift, hydraulic jet pumps

For example, for a field under primary production, if the vertical wells are acidized or fractured, then the production has been assisted to improve oil recovery. For a field under secondary oil recovery with vertical production and injection wells, if electrical submersible pumps are installed in the production wells or horizontal injection wells are drilled, the production has been assisted to improve oil recovery.

#### **7. Can there be EOR without AOR?**

AOR techniques are commonly used in combination with EOR processes. AOR techniques such as stimulation, conformance control, artificial lift, and horizontal wells, are often applied during the implementation of both secondary oil recovery and EOR. For example, artificial lift is used to reduce the flowing bottomhole pressure and thus allow more fluid to come to the surface, and stimulation is often employed to remove near-wellbore damage and thus increase EOR productivity. Conformance control, horizontal wells, and/or multilateral wells are adopted to increase the sweep efficiency of EOR injection fluids in the reservoir. Hydraulic fracturing assists most EOR processes through increased rock contact. EOR can be effective to mobilize and displace oil in the reservoir, but AOR plays an important role in efficiently producing EOR oil. In summary, AOR becomes an integral part of EOR operations and an effective EOR flood is not likely to exist without AOR.

#### **8. What additional benefits will the new IOR, AOR, and EOR classification bring to the petroleum engineering community?**

The single greatest benefit will be to improve our ability to clearly define what types of technology we are discussing during communication. EOR retains a total separation from AOR, and IOR can continue to be used as a global or umbrella term indicating all technologies applied beyond the conventional primary oil recovery techniques. EOR has retained its most-often applied definition, and AOR becomes a more-accurate term to define those techniques under IOR but very different from EOR.

#### **9. Where do the technologies applied for unconventional fields fall within these terms, or is it a mix?**

The development strategy for an unconventional oil field utilizes primary oil recovery drive, but it receives massive assistance from AOR techniques, namely horizontal drilling and fracturing. These techniques assist the principal solution-gas drive recovery mechanism

through the development of massive surface-area contact. Thus, the field development strategy for unconventional assets is to use primary oil recovery with AOR.

#### **10. Why is conformance control considered part of AOR and not EOR?**

In most cases, conformance-control efforts involve the diversion or redirection of the principal displacing fluid. These techniques are not designed to alter the properties of the main displacing fluid. This is true for a cement squeeze, bridge plug, straddle assembly, or a near-wellbore polymer plugging treatment. These relatively near-wellbore techniques are designed to fill and/or plug a watered-out or completely displaced zone. In addition, conformance-control efforts that focus on redirecting fluid at the wellbore, such as pattern fluid rebalancing, do not alter the properties of the principal displacing fluid. However, as noted earlier, there are some polymer-injection operations that are focused on conformance control that would qualify as EOR, such as polymer flooding where the intent is to change the properties of the displacing fluid thus enhancing the mobility ratio and improving the sweep efficiency. Thus, the intent of the conformance control—and to some extent the volume involved in the effort is what is used to determine whether it is considered an AOR or an EOR technique.

Another type of polymer treatment that might be difficult to classify is the use of relative permeability modifiers. In this case, the intent of the product is to damage the  $K_{rw}$  in the zones containing high water saturations, thus limiting the water flow, and to limit the change to  $K_{ro}$ , thus allowing oil to continue flowing. Although this might sound like it should be classified as an EOR process, this treatment is only designed to function in the very near-wellbore region. These treatments primarily function only in high water saturation intervals and do not significantly alter the principal oil-recovery drive process and would therefore be classified as AOR.

### **Conclusions**

In summary, SPE membership and the oil industry over time developed oil-recovery terminology that became a bit disjointed, especially when it came to the term IOR. This term is used by some to describe those methods and techniques that increased recovery but did not involve significant changes to the principal oil displacement or drive process, as with EOR. In addition, some others used IOR to encompass all efforts that resulted in increased oil recovery. To reconcile these two different uses, this committee decided that a new term, AOR, should be introduced to better represent the nature of the recovery efforts that assist the principal or main recovery-drive mechanism. This allows us to maintain a separation of terms between AOR and EOR, but also allows IOR to be used as a global overarching term to represent all efforts that increase recovery beyond that achievable by applying only primary oil recovery. This slightly modified structure for our recovery terminology allows us to better communicate which efforts we are discussing or focusing on. It allows us to classify efforts based on the intent of the technology or method and provides a nomenclature that represents that intent.

This committee recognizes that it will require several efforts to communicate this new recovery terminology and structure, so expect to see more discussion on this through several publications, websites, and online venues.

We want to thank the SPE leadership for recognizing the need for this effort and providing the support and motivation to take on a subject that contains both historical and personal perspectives to overcome. We also want to thank the SPE membership for their active participation in SPE Connect and other online websites which further identified a need for this effort. We hope and believe that over time you will find this new structure to provide improved communication and clarity to our discussions on oil recovery.

## References

Baker, R., Dieva, R., Jobling, R. et al. 2016. The Myths of Waterflood, EOR Floods and How to Optimize Real Injection Schemes. Presented at the SPE Improved Oil Recovery Conference, Tulsa, Oklahoma, USA, 11–13 April. <https://doi.org/10.2118/179536-MS>.

Lake, L. W. 1989. *Enhanced Oil Recovery*. Englewood Cliffs, New Jersey, USA: Prentice Hall.

Lake, L. W., Johns, R. T., Rossen, W. R. et al. 2014. *Fundamentals of Enhanced Oil Recovery*. Richardson, Texas, USA: Society of Petroleum Engineers. <https://doi.org/10.2118/9781613993286>.

Stosur, G. J., Hite, J. R., Carnahan, N. F. et al. 2003. The Alphabet Soup of IOR, EOR and AOR: Effective Communication Requires a Definition of Terms. Paper presented at the SPE International Improved Oil Recovery Conference in Asia Pacific, Kuala Lumpur, Malaysia, 20–21 October. <https://doi.org/10.2118/84908-MS>.

Taber, J. J., Martin, F. D., and Seright, R. S. 1997. EOR Screening Criteria Revisited—Part 1: Introduction to Screening Criteria and Enhanced Recovery Field Projects. *SPE Res Eng* **12** (3): 189–198. <https://doi.org/10.2118/35385-PA>.

Wilhite G. P. 1986. *Waterflooding*. Richardson, Texas, USA: SPE Textbook Series, Society of Petroleum Engineers. <https://doi.org/10.2118/9781555630058>.