Productive state of the Oil&Gas platforms: a classification proposal for the mining statistical review

I. Antoncecchi*
S. Camporeale*
W. Da Riz**
S. Grandi***
V. Martinotti****
N. Santocchi***

* University of Milan, "Bicocca" on secondment to DGS-UNMIG
** GSE S.p.A.
*** Ministry of Economic Development DGS-UNMIG Div. VI
**** Ricerca sul Sistema Energetico – RSE S.p.A.

Over the last years in Italy, as well as in the rest of the world, the debate about the state of the Oil&Gas production platforms has caught more and more the attention of the media. This activity presents critical issues at social, environmental and economical levels for defining plans of mining closure and infrastructure decommissioning most of all. Establishing a scientific method to classify mining platforms and wells, and identifying an objective and systematic terminology, on the basis of their utility to reservoir production is becoming essential as well. The scientific literature uses a terminology for oil and gas wells, but on the contrary no international standard and common criteria are used for productive platforms. This paper aims at the proposal of a terminology and a classification method that could be adopted by the Italian Authorities for the analysis of the state of offshore Oil&Gas platforms, through the evaluation of the national database of the Italian Ministry of Economic Development – Directorate General for safety of Mining and Energy Activity (DGS-UNMIG).
***Keywords**: classification, Oil&Gas, platforms, terminology, decommissioning.*

Stato produttivo delle piattaforme Oil&Gas: una proposta di classificazione per la statistica mineraria. *In questi anni in Italia, così come nel resto del mondo, il dibattito sullo stato produttivo delle piattaforme per la produzione di Oil&Gas è sempre più sotto l'attenzione mediatica e rappresenta una criticità sociale, ambientale ed economica soprattutto ai fini della definizione di programmi di chiusura mineraria e dismissione degli impianti. E' diventato necessario individuare in modo oggettivo e sistematico una terminologia per definire lo stato dell'impianto in termini di una sua utilità alla produzione e coltivazione del giacimento oltre che definire un metodo scientifico di classificazione per lo studio statistico delle piattaforme. In letteratura esistono terminologie utilizzate da parte degli addetti ai lavori per la definizione di un pozzo petrolifero; al contrario non esistono ancora degli standard internazionali e dei criteri univoci per definire lo stato produttivo delle piattaforme. Questo lavoro propone una terminologia che potrebbe essere adottata dalle Amministrazioni italiane per la definizione dello stato produttivo degli impianti offshore, elaborata analizzando la banca dati nazionale degli impianti a mare attraverso un progetto di collaborazione nell'ambito degli accordi per la sicurezza offshore della DGS-UNMIG del Ministero dello Sviluppo Economico con enti di ricerca, università, e corpi delle Stato.*
***Parole chiave**: classificazione, Oil&Gas, piattaforme, terminologia, dismissioni.*

1. Introduction

A scientific and technical debate about the need to adopt a terminology for Oil&Gas wells started back in the 1940s. The current classification for hydrocarbon wells does not consider the necessity of the Administration of clear terminologies to identify the productive state of wells and platforms in order to ensure transparency and diffusion of data to all relevant stakeholders (civil society, local administration, environmental organizations, etc.). One of the main problems is the misunderstanding originated from non-operational offshore platforms. A practical example is the northern Adriatic Sea platforms case. In this region, several platforms are not operational because of the existence of administrative impediments, even if their production could be potentially relevant. How should we consider those types of platforms? In this paper, we try to apply the classification proposal to a case study in the northern Adriatic Sea.

This issue led the Italian Ministry of Economic Development to verify the nature of existing oil and gas platforms. This paper proposes a terminology and a classification method, which could be adopted by the Italian Authorities for the analysis of the productive state of offshore Oil&Gas platforms, through the evaluation of the national database of the Italian Ministry of Economic Development – Directorate General for safety of mining and energy activity (DGS-UNMIG).

From the DGS-UNMIG database, in this study we suggest the following nomenclature for platform state (Fig.1):

1. **Active/productive state:** the platform is active and connected to production wells.
2. **Inactive state:** the platform is inactive and related only to non-production wells. Such state is to be considered for decommissioning.
3. **Standby state:** the combination of the productive state of the platform and productive state of wells results in uncertainties on the inclusion as Active or Inactive state due to technical or administrative reasons. This state needs to be verified case-by-case consulting the expert opinion of the DGS-UNMIG competent Authority to decide in which category to inclu-

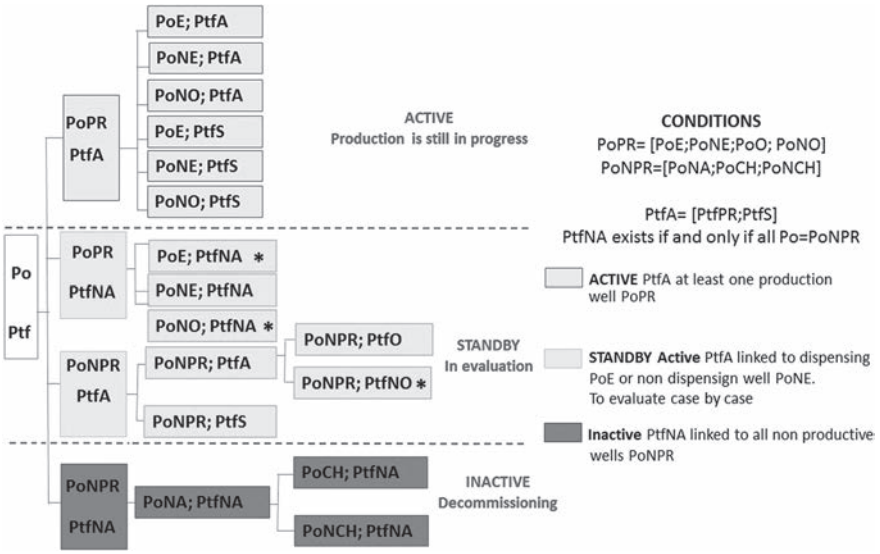

Fig. 1. Schematic representation of three States of an offshore platform as a result of the combination between the "productive state" classification of "wells" and "platforms": inactive; productive; "STAND BY" (i.e. the non-production plants need to be checked for the state of the plant from the technical and administrative points of view). It is important to point out that the chart contains all the possible combinations but not all of these are actually real cases. Marked with (*) the unreal cases.
Rappresentazione schematica dei tre stati delle piattaforme risultati dalle combinazioni tra la classificazione dello stato produttivo dei pozzi e la classificazione delle piattaforme: non attive; produttive; "STAND BY" (condizioni di non produttività degli impianti che necessitano di una verifica dello stato dell'impianto dal punto di vista tecnico e amministrativo). È importante sottolineare che il grafico riporta tutte le combinazioni possibili ma che non tutte queste sono effettivamente dei casi reali. Con il Simbolo (*) sono evidenziati i casi inesistenti.

de platforms and consequently to decide the potential decommissioning of the plant.

These three definitions are the results of all possible combinations between two different classifications subsequently illustrated (one of "wells" and one of "platforms"). Not all the categories in figure 1 represent a real case. In the following paragraphs, the methodologies used to obtain the three states and a case study in northern Adriatic Sea will be explained.

2. Methodology

The terminology used by experts in the hydrocarbon sector is the Lahee nomenclature of 1944, used as a standard also by the American Association of Petroleum Geologists (AAPG) and the American Petroleum Institute (API). The use of a shared nomenclature for the sector has an influence on management and administration at international level, furthermore, to define a common standard for the symbols to adopt in the official cartography production (PPDMA, 2012).

The debate started due to the great number of existing classes of wells in function of the life cycle of a petroleum project. It is important to notice that the life cycle of a petroleum project is linked both to technical and economic aspects associated with the estimation of hydrocarbon reserves.

The exploration phase, prior to drilling activities of the exploration well, is characterized by unproven resources, not (or roughly) estimated, while the uncertainties about reserves gradually decreases with development going from probable to possible and then to proven reserves.

The Lahee nomenclature considers both technical and economic aspects discriminating between the risks associated with the exploration/production phases of a new reservoir and the exploration/production phases of a new level of a well-known reservoir. Taking into account the risks, the Lahee classification considered the scope and the success of wells (*e.g. explorative, development and production well – discovery, development or abandoned well)*.

In addition to the previous ones, another class is about *suspended wells*. In this category all un-classified wells are found at the end of year; even though they have reached the expected depth (for example those waiting for a production test).

Furthermore, if in the past the problem of wells had already been dealt with and resolved by the Ministry adopting the aforementioned nomenclature for statistical reviews, no common standard for the status of offshore platforms has been defined or adopted yet.

One of the possible immediate platform classifications is the one related to the connection to one or more wells (Table 1).

By considering this classification the relevance for a terminology of the relation between platforms and wells is clear. In particular, how is a platform with all or some non-producing wells classified?

As an offshore platform is a plant with the purpose of exploiting a reservoir through wells, then the "productive state" of a platform can be defined considering the state of the related wells.

For the above reason, the terminology used by the DGS-UNMIG to define the productive state of wells is considered in this study in first place.

In detail, table 2 shows the terminology used by the DGS-UNMIG taking into account the technical nomenclature (http://unmig.mise.

Tab. 1. Relationship between platform type, size and number of connected wells.
Rapporto tra tipo di piattaforma, dimensioni e numero di pozzi allacciati.

Platform typology	Average dimension (m)	N. connected wells
Mono-tubular	8x8	1
Bi-tubular	19x4	2
Cluster	-	2<x<4
Reticular structure	46x22	>4
Submarine well head	-	0

gov.it/unmig/pozziattivi/st.asp) as follows:

- Production well: a well that is drilled with a good result. The well is defined productive after its completion and it remains productive until its mining closure;
- Producing well: a production well that is currently extracting hydrocarbons from the reservoir;
- Non-producing well: a production well that is not currently extracting hydrocarbons from the reservoir.
- Non-operative wells: are wells that have potentiality and could be productive but because of administrative impediments are not active now.
- Non-productive wells: are wells without potentiality or of no economic interest.

As practice suggests, the producing and non-producing states may vary several times during the lifetime of a production well. Therefore considering different states allows to define the transient phases of the production well when, due to technical/safety reasons, a period of inactivity could occur as requested by the operators under the authorization and the supervision of Mining Authorities (in Italy the DGS-UNMIG).

The second step is the definition of a classification for the productive state of a platform based on the terminology used for the classification of the productive state of wells (Table 3 takes into account the definitions of Table 2).

Following the terminology indicated in table 2 and table 3 it is possible to represent the classification adopted as in figure 2 in which "Po" stands for "wells" and "Ptf" stands for platforms:

- "Po" includes producing "PoE" and non-producing "PoNE";
- "Ptf" includes active "PtfA" and inactive "Ptf NA".

Oil&Gas platforms are mainly active or inactive. Among the active ones, useful platforms for production are those productive or potentially productive or useful also for other logistical support functions for oil and gas extraction. This last category of support, when linked to platforms defined as inactive and then no longer useful to production, could be considered for decommissioning.

The *inactive platforms* are defined as those completely associated with sterile or no longer productive wells and that do not have to support production. The novelty is the addition of the *inactive platform* as a new independent state of a platform. This represents a support for a clearer terminology to facilitate the dialogue with stakeholders; while at technical level, it is useful to clearly indicate that a platform could be considered for a possible decommissioning plan due to motivated non-utility criteria (over time) in terms of the plant's production. The application of the terminology to the DGS-UNMIG database has been carried out, alongside the development of the above-described theoretical construction. Firstly, it was implemen-

Tab. 2. Terminology proposed for the productive state of a hydrocarbon well.
Proposta di terminologie per indicare lo stato produttivo di un pozzo petrolifero.

Well state		Definition (DGS-UNMIG)
Production (active)	Producing	a well drilled with a good result. The producing well is a production well that is currently extracting hydrocarbons or injecting fluids from/to the reservoir.
	Non-producing (suspended)	a well drilled with a good result. The non-producing well is a production well that is not currently extracting hydrocarbons from the reservoir
Non-operative	(suspended)	Non-operative wells are wells that have good potentiality and could be productive; but because of administrative impediments are not active now.
Non-productive (inactive)	Closed about to close	Non-productive wells are wells without potentiality or considered to be not economically viable (Sterile).

Tab. 3. Terminology proposal to define the productive state of a hydrocarbon platform.
Proposta di terminologie per indicare lo stato produttivo di una piattaforma petrolifera.

Platform state	Definition
Active	Connected to production (one or more producing or non-producing wells).
Non operative	In areas subject to regulatory constraints or pending the granting of the exploitation concession
Inactive	Not useful for producing a field or it does not support the production of a complex platform cluster. Related to all non-productive wells or non-producing wells (for more than 5 years)

Tab. 4. Correlation between wells and platforms in the A.C 17 .AG exploitation license and application of the classification proposal.
Correlazione tra le tipologie dei pozzi e delle piattaforme presenti nella concessione di coltivazione A.C 17 .AG e applicazione della classificazione proposta.

Platform	Producing wells	Non producing wells	Platform state
Giulia 1		1	Inactive
Regina	6		Active
Regina 1		1	Active

ted individually to the "wells" and "platforms" categories and then in combination. The number of combinations in Figure 1 were obtained after the definition of the two classifications in Figure 2 and by the combination of all categories obtained for the "Ptf state" and "Po state".

For the definition of a decommissioning plan for the standby and inactive platforms, other important criteria should be considered along with technical ones.

3. Case study

Using this method, tested on the DGS-UNMIG database, a new classification for wells and platforms and their related productive state is defined. To understand how the classification can be applied to a particular situation and also in view of the mining statistical review, we illustrate the case study of A.C 17 AG exploitation license in the northern Adriatic Sea, related to the "REGINA" reservoir. From the database of DGS-UNMIG we obtain the following situation (Table 4):

– "Giulia platform" (Ptf) is linked to a non-producing well (PoNE)
– "Regina platform" (Ptf) is linked to six producing wells (PoE)
– "Regina 1 platform" (Ptf) is linked to one producing well (PoE)

Using the classification proposal for this case study it is possible to define the "Giulia 1" platform as inactive because it is related to a non-producing well not linked to the platform; despite the other two platforms are still active because Regina is linked to all producing wells and Regina 1 is linked to a temporary non-producing well. Consequently, the "Giulia 1" platform should be considered for possible decommissioning. The situation of the case study is graphically reported in figure 3.

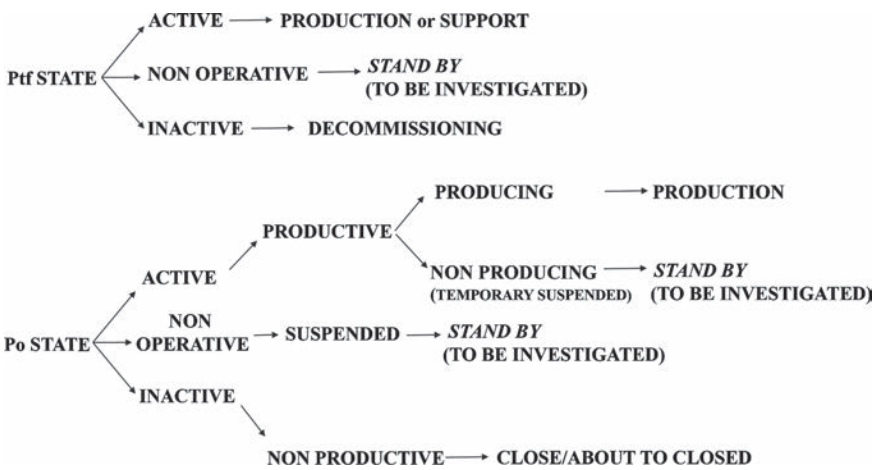

Fig. 2. Schematic representation of the classification of "wells" and "platforms" productive state.
Rappresentazione schematica della classificazione dello stato produttivo dei pozzi e delle piattaforme.

4. Conclusions

This approach needs to be compared with other similar databases to those of the DGS-UNMIG in order to give consistency to the classification. Nevertheless, the classification is intuitive and has practical use. This work has placed for the first time at a technical/scientific level the question of terminology to describe the productive state of platforms, and tries to give a preliminary solution to the problem. There are some criticalities related to the specific features of a single platform for which an assessment on technical characteristics of field development should be considered case-by-case by the competent Authorities. However, the Authorities may make first considerations based on the inactivity and standby state of some platforms and the non-productivity of related wells. Particularly an "inactive" state is defined for the first time. This state is important for transparency reasons for the Authorities. Furthermore, it can be significant to define a decommissioning plan. In addition, the "Standby" state could be and innovative term to introduce to all stakeholders such case of long life infrastructures potentially productive but non-producing (or other types of combination). The Authority should be cautious in order to establish a time when platforms are considered almost active (even if they are linked to all non-producing wells) or on the contrary when platforms have to be considered inactive. An operative platform is another important category derived from the classification proposal: it is not productive only for technical administrative reasons and could have relevant potentiality. Finally, this work provides some definitions and a method

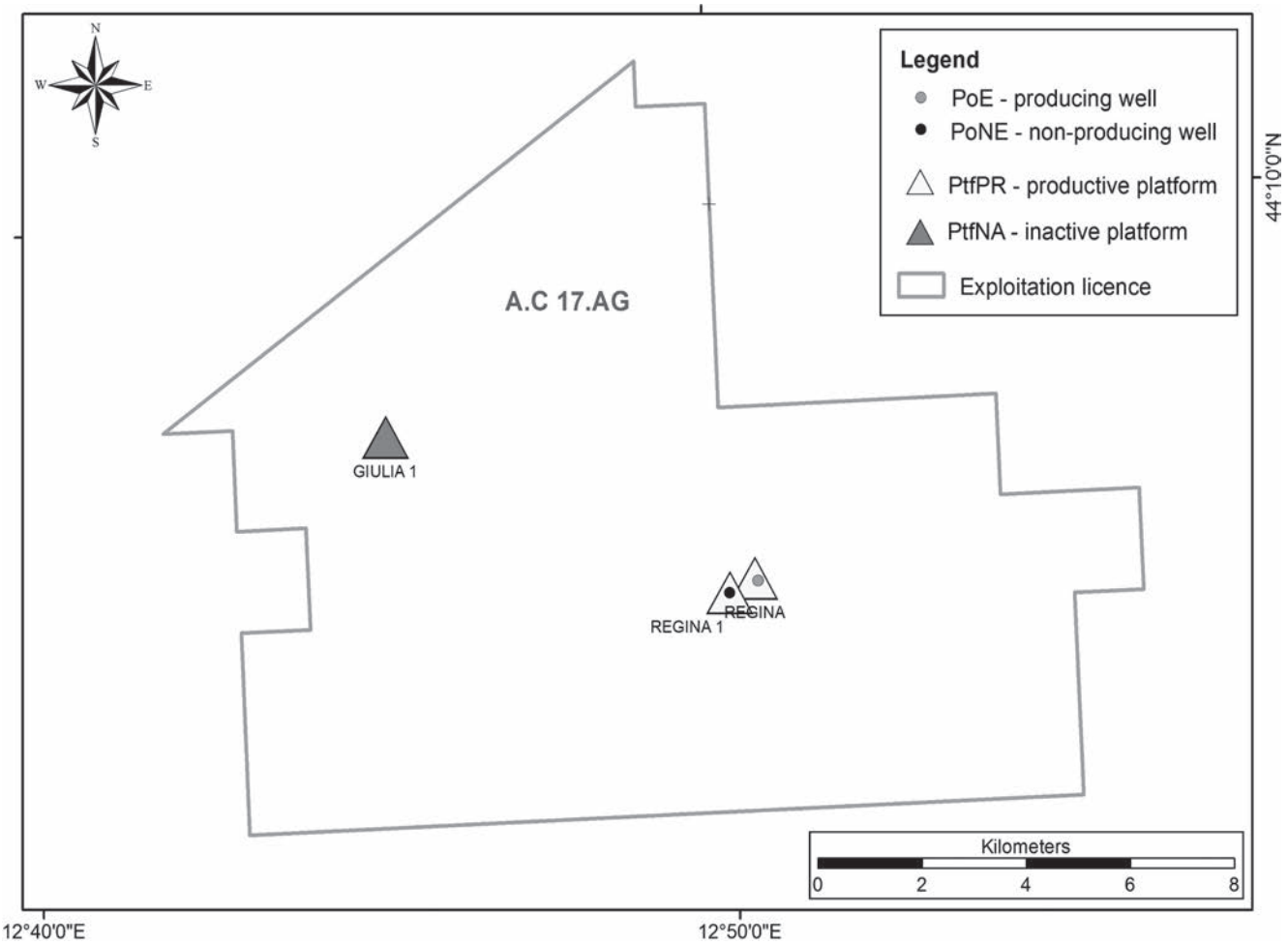

Fig. 3. Example of the application of the classifying method to the A.C 17 .AG exploitation license.
Esempio grafico dell'applicazione del metodo classificatorio alla concessione A.C 17 .AG.

to interpret data about wells and platforms as well as to understand whether they could be considered for a decommissioning plan.

References

Lahee, F.H., 1944. *Classification of exploratory drilling and statistics for 1943*, «American Association of Petroleum Geologists. Bulletin», Vol. 28, pp. 701-721.

PPDM ASSOCIATION, 2012 – *Wells status & classification.*

Web links

http://unmig.mise.gov.it/unmig/pozziattivi/st.asp (accessed 22/08/2017 at web of DGS-UNMIG of the Italian Ministry of Economic Development).

Acronyms

PoPR – PoA – production well or active well
PoNP – PoNA non-production well or inactive well
PoE – producing well
PoNE – non-producing well
PoNO – non-operative well
PoNA – non-active well
PoNCH – well towards closure
PoCH – closed well
PtfA – active platform
PtfPR – productive platform
PtfNPR – non-productive platform
PtfS – support platform to the production
PtfO – operative platform
PtfNO – non operative platform
PtfNA – inactive platform

Acknowledgement

This paper is conceived and funded by the Italian Ministry of Economic Development within the partnership of the "Network for Offshore Safety". The authors gratefully acknowledge the valuable support of Division VI and Division II of the Directorate General for Safety and National Mining Office (DGS-UNMIG) of the Ministry of Economic Development.