

Free Accepted Article From Repository

Look Up Full Text

Full Text from Publisher

Find PDF

Full Text Options

Export...

Add to Marked List

1 of 1

## Experimental study to evaluate the environmental impacts of disposed produced water on the surrounding ecosystems

By: [Ganat, TA](#) (Ganat, T. A.)<sup>[1]</sup>; [Hrairi, M](#) (Hrairi, M.)<sup>[2]</sup>; [Mohyaldinn, ME](#) (Mohyaldinn, M. E.)<sup>[1]</sup>

[View Web of Science ResearcherID and ORCID](#)

INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Volume: 17 Issue: 3 Pages: 1439-1454

DOI: 10.1007/s13762-019-02558-2

Published: MAR 2020

Early Access: NOV 2019

Document Type: Article

[View Journal Impact](#)

### Abstract

The large volume and high salinity of produced water (PW) could pose severe environmental impacts. This paper presents the laboratory results on PW from G oil field, located in North Africa, and on groundwater samples from nearby freshwater wells, in order to best comprehend the chemical composition of PW and to evaluate their potential impact on the surrounding environment of this oil field. Such a sizeable data set can make it difficult to integrate, interpret and represent the results. Thus, multivariate statistical techniques were used in the usefulness evaluation of geochemical groundwater control process classification and identification. Principal component analysis of produced water identified three components: the first being a salinization factor that accounted for 53.6% of the overall variance; the second accounted for 24.3% of overall variance and was mostly dictated by scale forming potential; and the third component (12.3% of total variance) representing the quality of the water formed by the rock water interaction. The aforementioned components demonstrated that the quality of discharged produced water didn't meet national or international standards. For the groundwater analysis, two principal components/clusters were identified. The first one (69.6% of total variance) represented the hardness and salinity of the water, and the second one (18.4% of total variance) can be regarded as the overall effect of weathering and interactions between water and rock on the groundwater quality factor in general. The analysis did not show any contamination in groundwater at the G oil field and in the nearby farms water wells.

### Keywords

**Author Keywords:** Produced water; Groundwater; Environmental impact; Chemistry analysis; Principal component analysis; Cluster analysis

**KeyWords Plus:** SIRT BASIN; TECHNOLOGIES; TOXICITY; GEOLOGY; SURFACE

### Author Information

**Reprint Address:** Hrairi, M (reprint author)

+ Int Islamic Univ Malaysia, Dept Mech Engn, POB 10, Kuala Lumpur 50728, Malaysia.

### Addresses:

+ [ 1 ] Univ Teknol PETRONAS, Dept Petr Engn, POB 32610, Seri Iskandar, Perak, Malaysia

+ [ 2 ] Int Islamic Univ Malaysia, Dept Mech Engn, POB 10, Kuala Lumpur 50728, Malaysia

**E-mail Addresses:** [meftah@iiu.edu.my](mailto:meftah@iiu.edu.my)

### Publisher

SPRINGER, ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

### Journal Information

**Impact Factor:** [Journal Citation Reports](#)

### Categories / Classification

**Research Areas:** Environmental Sciences & Ecology

**Web of Science Categories:** Environmental Sciences

### See more data fields

1 of 1

### Citation Network

In Web of Science Core Collection

0

Times Cited

[Create Citation Alert](#)

33

Cited References

[View Related Records](#)

### Use in Web of Science

Web of Science Usage Count

1

Last 180 Days

1

Since 2013

[Learn more](#)

This record is from:

Web of Science Core Collection

- Science Citation Index Expanded

### Suggest a correction

If you would like to improve the quality of the data in this record, please [suggest a correction](#).

## Cited References: 33

Showing 30 of 33 [View All in Cited References page](#)

(from Web of Science Core Collection)

1. [Review of the petroleum geology of the western part of the Sirt Basin, Libya](#)  
By: Abdunaser, K. M.  
JOURNAL OF AFRICAN EARTH SCIENCES Volume: 111 Pages: 76-91 Published: NOV 2015

Times Cited: 2

2. **The geology and hydrocarbon habitat of the Sarir Sandstone, SE Sirt Basin, Libya** Times Cited: 22  
 By: Ambrose, G  
 JOURNAL OF PETROLEUM GEOLOGY Volume: 23 Issue: 2 Pages: 165-191 Published: APR 2000
  
3. Title: [not available] Times Cited: 663  
 Group Author(s): American Society for Testing Materials (ASTM)  
 Water and environmental technology. Annual book of ASTM standards, U.S.A. Sec. 11, Vol.11.01and 11.02 Volume: 11.01and 11.02 Published: 2002
  
4. **Analysis of oilfield waters** Times Cited: 2  
 By: [Anonymous].  
 API RP 45 Published: 1998  
 Publisher: API, Washington DC
  
5. Title: [not available] Times Cited: 1  
 By: Burnett, DB.  
 Potential for beneficial use of oil and gas produced water Published: 2010  
 2 Nov 2018  
 URL: <http://www.circleofblue.org/waternews/wp-content/uploads/2010/08/beneficialuses-produced-water.pdf>
  
6. **Mixed hydrophilic/hydrophobic fiber media for liquid-liquid coalescence** Times Cited: 2  
 Patent Number: 2010/0200512 A1  
 Inventor/Assignee: Chase, G; Kulkarni, P.  
 US Patent Published: 2010
  
7. Title: [not available] Times Cited: 1  
 Group Author(s): EGA  
 Study of environmental impacts on produced water and soil in oases area Published: 2004  
 Unpublished Report  
 Publisher: Environment General Authority, Tripoli, Libya
  
8. **A review of environmental impacts of salts from produced waters on aquatic resources** Times Cited: 22  
 By: Farag, Aida M.; Harper, David D.  
 INTERNATIONAL JOURNAL OF COAL GEOLOGY Volume: 126 Special Issue: SI Pages: 157-161 Published: JUN 1 2014
  
9. **Evaluation of NF/UF membrane treatment in de-oiling produced water in-situ at a heavy-oil production facility in western Canada** Times Cited: 1  
 By: Fraser, J; Zaidi, A; Preston, M; et al.  
 PRODUCED WATER 2: ENVIRONMENTAL ISSUES AND MITIGATION TECHNOLOGIES Book Series: ENVIRONMENTAL SCIENCE RESEARCH Volume: 52 Pages: 471-483 Published: 1996
  
10. **Toxicity of sediments from around a North Sea oil platform: are metals or hydrocarbons responsible for ecological impacts?** Times Cited: 76  
 By: Grant, A; Briggs, AD  
 MARINE ENVIRONMENTAL RESEARCH Volume: 53 Issue: 1 Pages: 95-116 Published: FEB 2002
  
11. **Oil and gas produced water management and beneficial use in the western united states** Times Cited: 1  
 By: Guerra, K; Dahm, K; Dunderf, S.  
 Science and technology program report no. 157 Published: 2011  
 5 Jan 2018  
 Publisher: Bureau of Reclamation, Department of the Interior, Washington DC  
 URL: <http://www.usbr.gov/research/AWT/reportpdfs/report157.pdf>
  
12. **Influences of water treatment agents on oil-water interfacial properties of oilfield produced water** Times Cited: 8  
 By: Guo Jixiang; Cao Jingjing; Li Mingyuan; et al.  
 PETROLEUM SCIENCE Volume: 10 Issue: 3 Pages: 415-420 Article Number: 1672-5107(2013)10:3<415:IOWTAO>2.0.TX;2-# Published: SEP 2013
  
13. **REVIEW OF POTENTIAL TECHNOLOGIES FOR THE REMOVAL OF DISSOLVED COMPONENTS FROM PRODUCED WATER** Times Cited: 71  
 By: HANSEN, BR; DAVIES, SRH  
 CHEMICAL ENGINEERING RESEARCH & DESIGN Volume: 72 Issue: A2 Pages: 176-188 Published: MAR 1994
  
14. **Barnett and appalachian shale water management and reuse technologies** Times Cited: 5  
 By: Hayes, T; Severin, BF; Engineer, PSP; et al.  
 Contract Volume: 8122 Pages: 05 Published: 2012  
[\[Show additional data\]](#)
  
15. Title: [not available] Times Cited: 4  
 By: IGWE CO  
 J POLLUT EFF CONT Volume: 1 Pages: 102 Published: 2013
  
16. Title: [not available] Times Cited: 7  
 By: Islam, S.  
 THESIS Published: 2006

17. **The Composite Perforating Dynamic Testing Technology Research of Coal-bed Gas Well** Times Cited: 80  
 By: Li, H.L.  
 THESIS Published: 2013  
 Master's Thesis  
 Publisher: North University of China, Taiyuan, China
18. **A reverse osmosis treatment process for produced water: optimization, process control, and renewable energy application** Times Cited: 2  
 By: Mareth, B.  
 THESIS Published: 2006  
 Dissertation  
 Publisher: Texas A&M University
19. Title: [not available] Times Cited: 7  
 By: \*OGP  
 120324 OGP Published: 2002
20. **Surface and groundwater water quality assessment using multivariate analytical methods: A case study of the Western Niger Delta, Nigeria** Times Cited: 79  
 By: Omo-Irabor, Omoleomo Olutoyin; Olobaniyi, Samuel Bamidele; Oduyemli, Kehinde; et al.  
 PHYSICS AND CHEMISTRY OF THE EARTH Volume: 33 Issue: 8-13 Pages: 666-673 Published: 2008
21. Title: [not available] Times Cited: 1  
 Group Author(s): Owner Oil Company  
 G, D, B Reservoirs-Vol 1, Reservoir Engineering Study Volume: 1 Published: 2002
22. Title: [not available] Times Cited: 1  
 Group Author(s): Owner Oil Company  
 G, D, B Reservoirs-Vol 2, Reservoir Engineering Study Volume: 2 Published: 2002
23. **Estimating the acute toxicity of produced waters to marine organisms using predictive toxicity models** Times Cited: 4  
 By: Pillard, DA; Tietge, JE; Evans, JM  
 PRODUCED WATER 2: ENVIRONMENTAL ISSUES AND MITIGATION TECHNOLOGIES Book Series: ENVIRONMENTAL SCIENCE RESEARCH Volume: 52 Pages: 49-59 Published: 1996
24. **Systems and methods for de-oiling and total organic carbon reduction in produced water** Times Cited: 1  
 Patent Number: US 20150122481 A1  
 Inventor/Assignee: Rafique, JS.  
 US Patent Published: 2013
25. **Groundwater characterization and selection of suitable water type for irrigation in the western region of Bangladesh** Times Cited: 9  
 By: Rahman, Mirza A. T. M. Tanvir; Saadat, A. H. M.; Islam, Md. Safiqul; et al.  
 APPLIED WATER SCIENCE Volume: 7 Issue: 1 Pages: 233-243 Published: MAR 2017
26. **From flowback to fracturing: water recycling grows in the Marcellus shale** Times Cited: 31  
 By: Rassenfoss, S.  
 J. Pet Technol Volume: 63 Issue: 7 Pages: 48-51 Published: 2011
27. **Oily wastewater treatment using ultrafiltration** Times Cited: 46  
 By: Salahi, Abdolhamid; Mohammadi, Toraj; Pour, Ali Rahmat; et al.  
 DESALINATION AND WATER TREATMENT Volume: 6 Issue: 1-3 Pages: 289-298 Published: JUN 2009
28. **Desalination and Reuse of High-Salinity Shale Gas Produced Water: Drivers, Technologies, and Future Directions** Times Cited: 341  
 By: Shaffer, Devin L.; Chavez, Laura H. Arias; Ben-Sasson, Moshe; et al.  
 ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume: 47 Issue: 17 Pages: 9569-9583 Published: SEP 3 2013
29. **Assessment of surface water quality using multivariate statistical techniques: A case study of the Fuji river basin, Japan** Times Cited: 805  
 By: Shrestha, S.; Kazama, F.  
 ENVIRONMENTAL MODELLING & SOFTWARE Volume: 22 Issue: 4 Special Issue: SI Pages: 464-475 Published: APR 2007
30. **Recycling flowback and produced water in tight-oil development** Times Cited: 2  
 By: Wasylishen, R.  
 Desalin. Water Reuse Volume: 22 Issue: 2 Pages: 26-30 Published: 2013

