

# INFLUENCE OF OIL PRICES IN DYNAMIC POSITIONING TRAINING

ZALOA SANCHEZ-VARELA<sup>1\*</sup>, DAVID BOULLOSA-FALCES<sup>2†</sup>, JUAN L. LARRABE-BARRENA<sup>2‡</sup>  
& MIGUEL A. GÓMEZ-SOLAECHÉ<sup>2§</sup>

<sup>1</sup> University of Split, Faculty of Maritime Studies, Croatia.

<sup>2</sup> Bilbao School of Engineering, University of the Basque Country UPV/EHU, Spain.

## ABSTRACT

The main purpose of this research is to present the influence of the oil price drop in the offshore training industry and the actions taken to minimise this effect. In particular, data corresponding to the Offshore Dynamic Positioning (DP) training and certification scheme by the Nautical Institute were used for the research. Since the oil price began to drop by the end of 2014, the oil and gas industry had to make some readjustments to keep the profits and continue in the business. The offshore DP training was affected by this crisis in two ways: the number of candidates starting the certification scheme dropped significantly; and on the other hand, candidates who had already begun the scheme were unable to complete the required number of days to be able to access the DP Simulator course, or for obtaining the DP Operator certificate. During this period, the training and certification scheme has undergone some changes to adapt to the new situation and to try to resolve the problems mentioned above. The analysis of the data shows that the effect of the oil price drop was not initially affecting the training but only began to show the consequences after some months.

*Keywords:* dynamic positioning, offshore, oil crisis.

## 1 INTRODUCTION

Dynamic positioning (DP) is a piece of highly-developed equipment that helps the ships maintain a specific position at sea, by getting information from different position reference systems and actuating thrusters and rudders automatically. This automation also allows the vessel to maintain a course and speed in a pre-determined path (what is known as follow-up) [1].

Nowadays, the dynamic positioning systems are used in a vast variety of ships, but for this study, only the offshore-related vessels and rigs will be taken into account, as the oil crisis is directly affecting such industry [2].

### 1.1 Dynamic positioning training

Such refined equipment can only be used by certified Dynamic Positioning Operators (DPOs) [1]. For becoming a DP Operator, and as stated by IMO [3], a training and certification scheme must be followed.

Currently, in the oil and gas industry, all DP Operators must be certified by the standards set up in IMO MSC/Circ. 738 [4]. In this circular, the standards of IMCA M 117 [5] are mentioned.

On behalf of the International Maritime Contractors Association (IMCA) and since 1983, the Nautical Institute (NI) manages the training scheme for prospective DPO candidates and issues the corresponding certificates. The Nautical Institute is a non-profit organisation [6].

\* ORCID: <http://orcid.org/0000-0001-9212-0330>

† ORCID: <http://orcid.org/0000-0002-3242-0283>

‡ ORCID: <https://orcid.org/0000-0002-5906-1006>

§ ORCID: <http://orcid.org/0000-0003-1509-046X>

The fact that the IMCA standards are mentioned in the IMO MSC/Circ. 738 [4], and that The Nautical Institute is managing the scheme on behalf of IMCA makes this scheme the most widely used and recognised in the industry.

### 1.1.1 The Nautical Institute Certification Scheme from 2012 to 2014

As the period of study starts in 2014, it is essential to know how the scheme was organised back then, to be able to analyse the differences with the new system in 2015.

The DP training scheme started with the candidate attending a DP Basic/Induction course at an accredited training centre. The course lasted 24 hours distributed in 4 days, and at the end of the same, an online exam was taken, with a passing mark of 70% of the 40 questions answered correctly within 75 minutes. This exam was managed directly by the Nautical Institute, and the accredited Training Centre acted only as an invigilator centre [6].

After the DP Basic/Induction course and assessment was passed, the candidate was given the course certificate and a Dynamic Positioning logbook, issued by The Nautical Institute (NI DP logbook), where he or she would be recording the tasks carried out while on board a dynamic positioning vessel [6].

The candidate had to complete 60 days on board before attending the DP Simulator course.

The DP Simulator course, also lasting 24 hours, had no online exam and only a practical assessment in the simulator. It is not necessary to complete this second course in the same training centre, but it is always compulsory to enrol in an accredited training centre [6].

After this DP Simulator course, the prospective DPOs would have to complete 180 DP days before being able to apply for the DPO license [6].

### 1.1.2 The Nautical Institute Certification Scheme from 2015

With the new standard [7], The Nautical Institute's Dynamic Positioning Offshore Scheme consists of 4 phases, named with letters. Phase A is the Dynamic Positioning Induction course, which consists of 28 hours of tuition, of which approximately 80% are theoretical and 20% practical lessons. After the tuition, the online exam takes place, where the candidates need to obtain a score of at least 70% to pass. The online exam is managed by the Alexis platform on behalf of the Nautical Institute [7].

Once the candidate has the DP Induction certificate, he or she goes for Phase B on board a DP vessel and needs to achieve a minimum of 60 DP days. The tasks performed have to be evidenced in the NI DP logbook.

When the candidate has achieved the minimum number of DP days, he or she can take part in the DP Simulator course (Phase C). This course has a total of 28 hours, of which 20% is theoretical tuition and 80% consist of practical exercises on a simulator.

This course has three different assessments. First, an online evaluation managed also by the Alexis platform on behalf of the Nautical Institute, which was fully implemented in 2017. Second, a practical assessment (called DP Set Up practical assessment), which is performed by the training centre and in which certain items defined by the NI are assessed. Finally, a formative assessment, to manage the training during the course and adapt to the needs of the candidates [1].

After the DP Simulator certificate is obtained, the candidate is ready for Phase D of the scheme, in which he or she again joins a DP vessel to get the final training of the scheme. After evidencing at least 60 DP days, the candidate is ready for applying for DP Operator licence (Phase E).

The time to complete the training scheme for those who start the Induction course after January 2015 is four years. This license should be renewed every five years, by evidencing at least 150 DP days during the period [7].

### 1.1.3 Training centres accredited by The Nautical Institute

Training Centres, who wish to receive Accreditation from the Nautical Institute to deliver Dynamic Positioning courses, must pass an audit where simulators, administration processes and quality management are revised thoroughly for compliance with the NI standards [6].

With the new standards in force since 2015 [7], the conditions for obtaining the accreditation have become more stringent. For example, the minimum equipment requirement for the DP Induction course is a Class C simulator, but the DP Simulator can only be delivered in a Class A or B simulator. It is also stated in the new standards that training centres will only be accredited if they can provide both courses (DP Induction and DP Simulator), which makes it mandatory for all training centres to possess at least a Class B simulator [7].

As of March 2019, the total number of accredited training centres is 95 (35 in Europe, 6 in Africa, 21 in America, 31 in Asia and 2 in Australiasia) [8].

## 1.2 Oil price crisis

It is historically usual to refer to oil crisis whenever the oil prices rise (such as the 1973 oil crisis), but in this paper, we are referring to the crisis in the oil and gas industry due to the drop in oil prices which began in 2014.

Causes for this shock have been studied [9], [10] and include an oversupply of oil, OPEC's policy of non-cutting oil production, the lift of Iran's sanctions, etc. [11].

The oil price fluctuation has left severe consequences in the offshore industry; the rig utilisation in the North Sea (Europe) fell from a steady 98% to approximately 55% by the end of 2016 [12]. The offshore supply vessel (OSV) fleet was also severely affected: in August 2015, 40 vessels were laid up in North West Europe [13], and in October of the same year, there were over 90 vessels [14].

This reduction also affected the platforms, as they were cold or warm stacked. In January 2015, there were five platforms stacked [13], one year later the number had increased to 34 [12], and by the end of 2016 there were over 60 stacked platforms [12].

For the study, the Brent Blend (BRENT) crude oil price was obtained from the U.S. Energy Information Administration, in January 2017 [15]. In Fig. 1, we can see how the BRENT oil price evolves during the period.

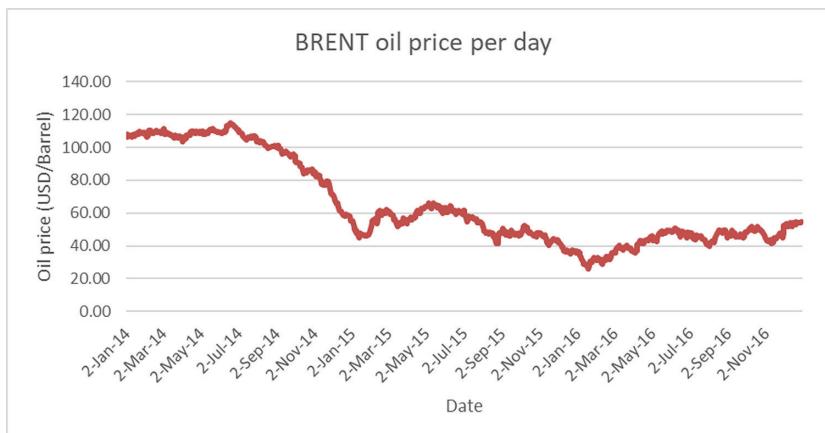


Figure 1:BRENT daily prices during the period 2014–2016 (Prepared by the authors, with data obtained from the US Energy Information Administration).

Checking the variation in time of the oil prices, we can see how the maximum value of the period corresponds to 19th June 2014, when the price was 115.19 USD/barrel. By the end of 2014, the average oil price had dropped to 55.27 USD/barrel, meaning a decrease of 52%. In January 2016, the price reached a minimum of 26.01 USD/barrel, which meant a 76 % reduction in the price over 19 months. From this date, the prices began to rise very slowly and, by the end of the period of study, they were at around 55 USD/barrel.

## 2 METHODOLOGY

To carry out this study, data were obtained for training in dynamic positioning from an accredited DP centre in Europe. This training centre has been accredited continuously since 2008, and its location makes it have a constant flow of students.

Although it is evident that during the period of study the courses held have decreased, the task of this paper consists in investigating whether this fall in DP candidates is directly connected with the fall in oil prices. Also, the paper aims to know whether the two different courses have been equally affected.

First, the total number of dynamic positioning candidates (without taking into account which course were they attending) are accounted for and compared against the time series of the oil prices. Thus it will be established the relationship between the oil prices and the general dynamic positioning training.

Later, both DP induction and DP simulator will be individually compared to the oil prices, and the relationship will be checked for each course.

Finally, it will be checked when the effects of the oil prices began to be noticeable and will study the relationships before and after that moment. Thus we will be able to know the impact that the oil prices had on each course before and after that moment.

As a matter of confidentiality, the Training Centre only allows to reveal in the study the data of how many courses were held during the period, and in no case, the number of candidates included in each course (although the data were known for the authors for research purposes only). For this reason, the diagrams will show the data in percentage rather than in absolute values.

Other than that, we consider a categorisation of the occupation of the data could clarify and give a better comprehension of the correlation of the changes we want to measure.

## 3 RESULTS

In 2014 the training centre had a schedule for DP courses, which were distributed in alternative weeks: one week DP induction, next week DP simulator, and so on. On specific dates, no courses were scheduled (for example, for the Season Holiday in December/January).

According to The Nautical Institute [6], a maximum of eight candidates were allowed to participate in the DP Induction course and six candidates in the DP Simulator course during the period 2014-2015. Since 1st January 2015, due to the new NI Standards, there were allowed only four candidates for the Simulator course, while for the DP induction course remained the same [7].

Taking into account the number of candidates in each course, we can observe that, in 2014, there were 25 DP Induction courses and 22 DP Simulator courses. The DP induction courses had a mean occupation of 74% and DP simulator courses 75%.

In 2015, there were 40 courses total, 20 DP Basic and 20 DP Simulator courses. The mean occupation for DP Basic courses was a bit less than 42%, whereas for the DP Simulator course the occupation was 71%.

In 2016 there were 20 courses, half the number of courses held the previous year, 9 for DP Basic and 11 for DP Simulator. The occupation respectively was 19.4% for DP Basic and 45.5% for DP Simulator.

As per the Training Centre's policy, the course could be held with a minimum of 2 candidates. At the beginning of 2016, and after their management review, they decided to change their policy and began to organise courses with only one candidate.

The total number of courses held in the entire period of three years was 107, of which 54 were DP Induction courses, and 53 were DP Simulator courses. This equal distribution of the type of course will be constant when we study the annual changes.

Half of the total courses during this period took place before March 2015. Only 19% of the courses took place in the last 12 months of the period of study.

Following the confidentiality policy of the training centre, the occupations of the courses were distributed in three different categories: High Occupation (more than 2/3 of the maximum occupation of the course), Medium Occupation (between 1/3 and 2/3) and Low Occupation when only less than 1/3 of the maximum occupation was achieved.

The data is illustrated in Table 1, where it can be seen that in 2014, the DP Induction course had a high occupation in the 64% of the courses, and the DP Simulator the 77%. In 2015, the DP Induction course had mainly a low occupation, which took 55% of the cases while the DP Simulator course was still maintaining a high occupation with 50% of the cases. In 2016, the low occupation of the courses was more evident for both courses: DP Induction in 77% of the cases and DP Simulator in 45% of the cases. It has been very apparent how during the period the training becomes less in both quantity of courses per year and occupation of the same.

### 3.1 BRENT Oil price against the percentage of candidates attending any DP course

The first step of our study was to compare the total number of candidates attending any dynamic positioning course, against the BRENT oil price. As per the confidentiality agreement, only the percentages of assistance will be presented.

The percentage of assistance indicates the ratio between the number of candidates that were actually attending a course, against the maximum number of participants that the course could have had.

In Fig. 2, we can see the time series for both the assistance percentage of candidates to any DP course and the BRENT oil price, taking the mean values for each month.

Table 1: Cross tabulation: DP courses held in the Training Centre against the categorised occupation of the course.

<b>Year</b>	<b>Name of course</b>	<b>Number of courses held during the period</b>			<b>Total</b>
		<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>	
2014	DP Induction	1	8	16	25
	DP Simulator	3	2	17	22
	Total	4	10	33	47
2015	DP Induction	11	4	5	20
	DP Simulator	4	6	10	20
	Total	15	10	15	40
2016	DP Induction	7	2	0	9
	DP Simulator	5	4	2	11
	Total	12	6	2	20

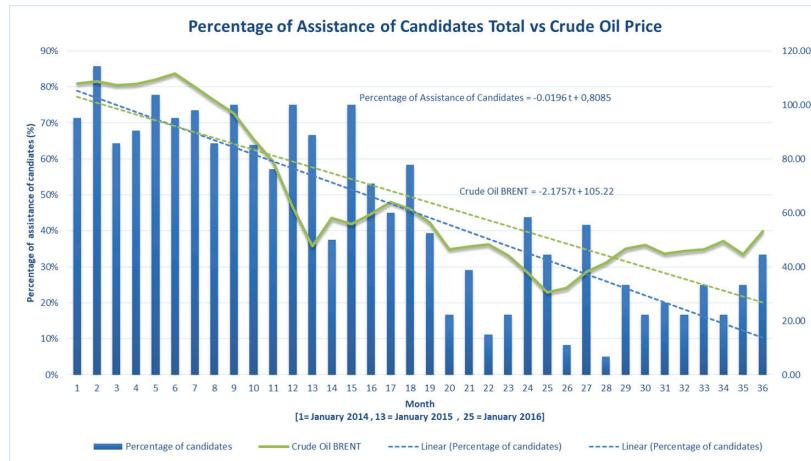


Figure 2: Assistance percentage against BRENT oil price. (*Diagram prepared by the authors*).

We can see the trends for both data, being very close. To see if both data are related, the correlation between them was checked. In the correlation analysis, we included the data for the number of candidates as well. The correlation matrix with the corresponding values of  $R^2$  is shown in Table 2.

The coefficients of determination from the correlation analysis indicate that there is an influence of the oil price in the dynamic positioning training. As the p-values calculated for each coefficient are very close to zero (values smaller than 0.05), it is then assumed that the oil price influences the dynamic positioning training.

### 3.2 BRENT oil price against DP induction course

For this section, only the monthly data for the Dynamic Positioning Induction course was taken into account. In Fig. 3, it is represented the comparison between this time series to that of the BRENT oil price.

Here we can see how the slope is  $-2.2\%$ , for the BRENT oil price and  $-2.5\%$  for the percentage of candidates that attended the DP Induction course (over the maximum number of candidates that could have attended per month). The correlation matrix between the total number of candidates assisting to this course, the percentage of assistance and the BRENT oil price is represented in Table 3.

The values of  $R^2$  calculated with the data given show that there is a very high correlation between the data.

Table 2: Correlation matrix for the number of candidates/percentage of assistance, against the WTI oil price.

	No. Candidates	% Assistance	Brent
No. Candidates	1	0.94214445	0.87422364
% Assistance	0.94214445	1	0.79059187
Brent	0.87422364	0.79059187	1

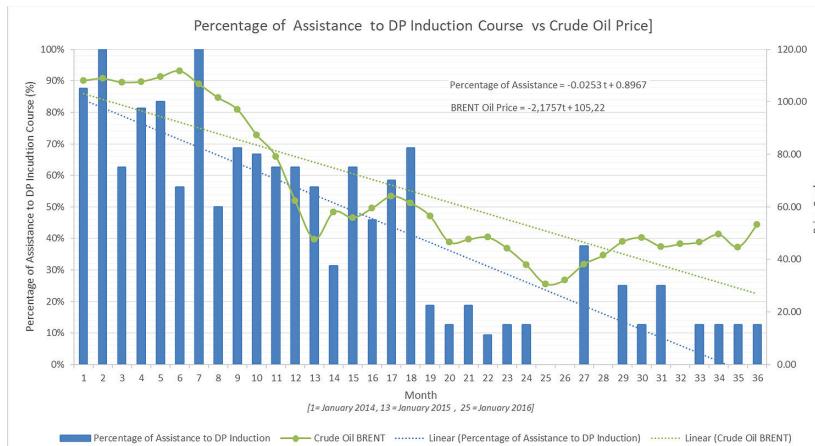


Figure 3: Percentage of the assistance of candidates to the DP Induction course against BRENT oil price. (*Diagram prepared by the authors*).

Table 3: Correlation matrix for the DP Induction course against the BRENT oil price.

	No. Candidates	% Assistance	Brent
No. Candidates	1	0.94011047	0.84559211
% Assistance	0.94011047	1	0.84334199
Brent	0.84559211	0.84334199	1

This data, along with the p-values calculated (in all cases values very close to zero, always smaller than 0.05), allows us to say that there is evidence showing the influence of the crude oil price in the DP Induction course.

### 3.3 BRENT Oil prices against DP Simulator course

In this section, the monthly data for the DP Simulator course was taken into account. In Fig. 4, we can see the graph corresponding to the DP Simulator course evolution for the period of study.

The slope for this trend is  $-1.47\%$ , which is almost half of the slope calculated for the DP Induction course and immediately shows that this course is not as influenced by the oil prices as it is the DP Induction course.

The correlation matrix for this course is represented in Table 4. The values of  $R^2$  shown in this table are not significant enough to show the influence of the oil price in the DP Simulator course.

### 3.4 Analysis of the results in two different periods

When performing the cross-correlation between the total number of candidates and the BRENT prices, it was noticed that there was approximately a 2-month delay between the fluctuation of the oil prices and the number of candidates undertaking any DP course.

Based on the experience of the studied Training Centre, it was noted that the effects of the fall in the oil prices began to be noticed in the number of candidates attending dynamic

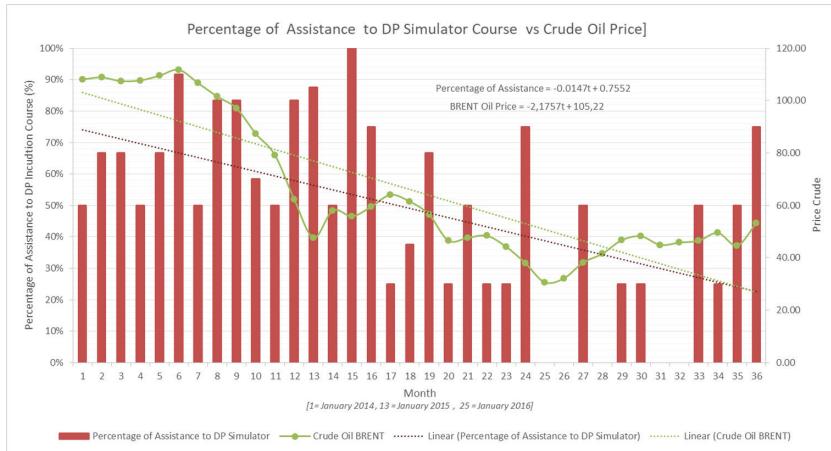


Figure 4: Percentage of the assistance of candidates to the DP Simulator course against the BRENT crude oil price.  
(Diagram prepared by the authors).

Table 4: Correlation matrix for the DP Simulator course against the BRENT oil price.

	No. Candidates	% Assistance	Brent
No. Candidates	1	0,80926743	0,73152202
% Assistance	0,80926743	1	0,49649562
Brent	0,73152202	0,49649562	1

positioning training from May 2015. Thus, the next step of our study is to check the correlations before and after that date and study the trends.

The data is then studied separately for the two periods, the first period is represented in Fig. 5 and the second period is represented in Fig. 6.

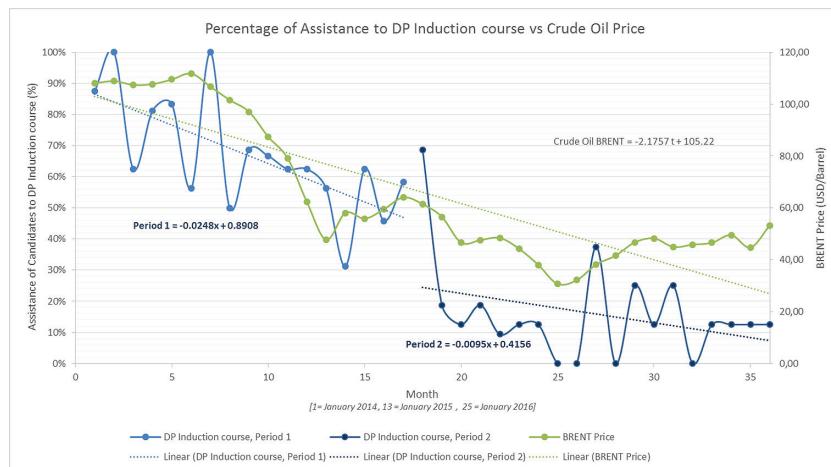


Figure 5: Percentage of the assistance of candidates to DP Induction course against BRENT oil price, two periods (before and after May 2015). (Diagram prepared by the authors).

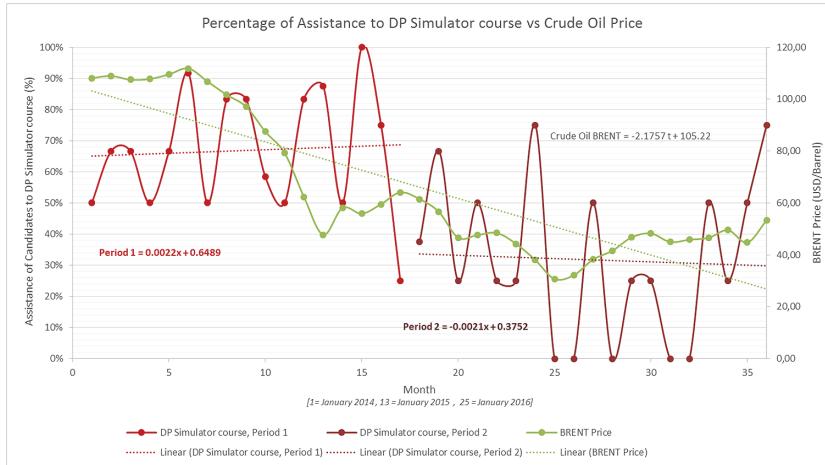


Figure 6: Percentage of the assistance of candidates to DP Simulator course against BRENT oil price, two periods (before and after May 2015). (*Diagram prepared by the authors*).

With just a quick view at the diagrams shown, it can be very clearly seen that the DP Induction course had a severe change in the sloping trend, whereas the DP Simulation course was not having a significant difference in the slope before and after May 2015.

The DP Induction course has a vast difference in the slopes between the two periods, being the slope corresponding to the first time region double than the slope of the second region.

However, there is not such a big difference for the DP Simulator course, were both slopes are having very similar values. There is evidence to asseverate that the DP Simulator has not been affected with the same severity as the DP Induction course has been.

#### 4 DISCUSSION

The purpose was to see the influence of the oil prices on the dynamic positioning overall training. The results showed that the dynamic positioning training was affected by the oil prices fluctuation, although there was a time gap of about two months, between the moment the prices began to fall and the time when the number of candidates for DP training began to be less.

The Training Centre should know that, based on the results of this study, the number of candidates has fallen due to the fell in oil prices. The adjustments to be made to continue with the business will be taken into account to endure the situation until after the prices rise again, as there is a delay between both variables.

Taking into account both courses separately, it was clear that the DP Induction course has been more clearly affected by the oil prices than the DP Simulator course. It is self-evident that up to the first half of 2015 the percentage of assistance was falling, but it has been even since then, which shows a very positive impact, even if the crude oil price continued dropping until the beginning of 2016. The reason for this is probably because of the people who had already entered the scheme and had to continue with phase C (DP Simulator course). This should guide the Training Centre to focus on attracting candidates to the DP Simulator course; of course, without neglecting the DP Induction course.

In the final section of the study, we defined two time regions: one starting in 2014 and ending in May 2015, the other from this date until the end of 2016. Studying the behaviour

of both courses separately was giving more light in the study, showing that the DP Induction course had been more severely affected than the DP Simulator course.

Given the situation with the DP training, Training Centres should take steps to minimise the consequences of this oil crisis, for example, it could be more competitive to have an in-house instructor rather than to hire him for each course held.

On the other hand, as the courses have such small participation, it could be determined that certain aspects of the course could become more quality. For example, the formative assessment could be more exhaustive when there are a smaller number of candidates attending. The exercises in the simulator should also be more instructive as there is more time to dedicate to each of them.

## 5 CONCLUSIONS

The oil prices drop has brought consequences in the offshore industry, as part of the saving policies of many companies in the sector. It seems utterly understandable that the training of dynamic positioning personnel drops together with the oil prices. On the one hand, the industry companies had to cut costs to continue being competitive in the industry, and on the other hand, plenty professionals had to be reallocated in different kinds of vessels, not being able to complete the scheme both financially or by lack of DP watch keeping days.

Some interesting conclusions can be drawn by looking at the results of our study.

The data indicates that the DP Induction course was more severely influenced by the effect of oil prices. This is probably because fewer people were entering the certification scheme after the standards changed in 2015.

By May 2015 it was evident that the oil prices were not going to improve any time soon, and so companies began to cut costs and did not invest in the training of new personnel but instead applied for candidates to take the DP Simulator course, and thus continue their education in pursuit of the DPO certificate.

The study indicates that the DP Simulator course has not been so severely affected, this can be because the candidates who were already in the scheme had decided to finish their education and obtain the DPO certificate which would be opening new job opportunities in the sector.

By dividing the period of study into two, we were able to analyse the trends, and it shows that the DP Induction course is not popular in the second time region, while the DP Simulator is still maintaining a similar pattern. These trends could be used to foresee what will be the trends in DP training for the next years.

## ACKNOWLEDGEMENTS

The authors would like to thank The Nautical Institute for the data and support received; the Training Centre who disinterestedly provided the data for this study; and the technical support from Mr Jordi Olle from Conceptos Claros.

## REFERENCES

- [1] Bray, D., *DP Operator's Handbook*, 2nd edn., The Nautical Institute: London, 2015.
- [2] Vinnem, J., *Offshore Risk Assessment*, 3rd edn. Springer: London, 2014.
- [3] International Maritime Organisation, *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)*, 2011.
- [4] International Maritime Organisation, Maritime safety committee, *Guidelines for Dynamic Positioning System (DP) Operator Training*, 2017.
- [5] International Marine Contractors Association, *The Training and Experience of Key DP Personnel*, Revised 2, 2016.

- [6] The Nautical Institute, *Dynamic Positioning Operator's Certificate*, January 2012.
- [7] The Nautical Institute, *Dynamic Positioning Operator's Training and Certification Scheme*, December 2014.
- [8] The Nautical Institute, *NI Accredited DP Training Centres*, March 2019.
- [9] Kilian, L., Oil price shocks: Causes and consequences. *Annual Review of Resource Economics*, **6**(1), pp. 133–154, 2014. <https://doi.org/10.1146/annurev-resource-083013-114701>
- [10] Kilian, L. & Vigfusson, R.J., The role of oil price shocks in causing us recessions. *Journal of Money, Credit and Banking*, **49**(8), pp. 1747–1776, December 2017. <https://doi.org/10.1111/jmcb.12430>
- [11] Jornsten, K., Sequencing offshore oil and gas-fields under uncertainty. *European Journal of Operational Research*, **58**(2), pp. 191–201, April 1992. [https://doi.org/10.1016/0377-2217\(92\)90206-O](https://doi.org/10.1016/0377-2217(92)90206-O)
- [12] Seabrokers Ltd., *Seabreeze*, Aberdeen, 2012–2015.
- [13] Seabrokers Ltd., *Seabreeze*, Aberdeen, October 2015.
- [14] Seabrokers Ltd, *Seabreeze*, Aberdeen, January 2015.
- [15] Spot prices for Crude Oil and Petroleum Products, U.S. energy information administration. [http://www.eia.gov/dnav/pet/pet\\_pri\\_spt\\_s1\\_d.htm](http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm) (accessed 2 January 2017).