Engineering Onboarding for the Oil and Gas Industry

A concept for 2017 and Beyond

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in order to understand the situation that the oil and gas industry is now facing concerning onboarding newly graduated engineers, you have to review the last thirty plus years. Lately it has been called the "big crew change", but it did not begin recently. It possibly started in the late 1980's or in the 1990's, but it was definitely in play by 1997-2002 timeframe.

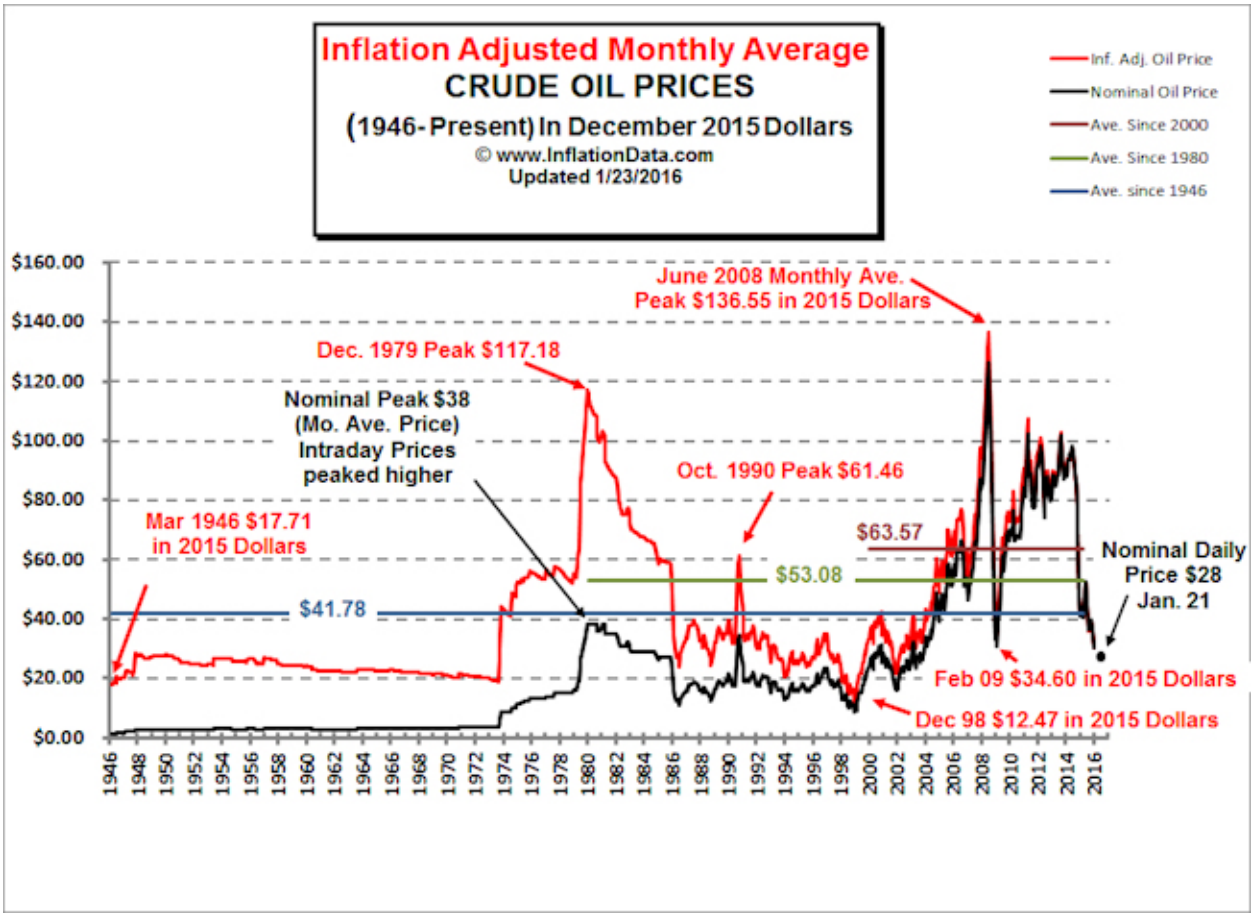

Figure 1 1946 to 2016 inflation adjusted nominal oil prices[1]

The oil industry was shocked into a new normal between the 1973-74 oil embargo and 1986 when OPEC manipulated a collapse in oil prices[2]. The period that followed (1986-2004) was a period of low oil price, with the exception of a spike in 1990 which is attributed to the first Gulf War.

[1] http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Chart.asp

[2] http://www.bloomberg.com/news/articles/2014-11-26/oil-bust-of-1986-reminds-u-s-drillers-of-price-war-risks

During this time the major oil companies started to understand that steady oil prices and steady profits as experience from 1946 up to 1973 (see Figure 1) was no longer possible. The dip in oil price in 1998 set off a series of mergers and acquisitions that effectively set the stage for the big crew change that is knocking at the door 18 years later. See Table 4 in Appendix A at the end for a recap of the company headcount pre-1997 as compared to today (2015 figures).

A close look at the period (see Table 1) shows just how active it was considering it only spanned about 60 months. Except for ConocoPhillips which split apart between upstream and downstream in 2012, all the big oil companies remain intact. However, Shell has acquired BG Group in 2016 and their combined numbers are not reflected here. It may also be worth noting that all of the 1997-2002 activity came at the end of a prolonged low oil price period (1986-2004). Will this happen again in 2017, 18, 19, or maybe by 2020?

Table 1 M&A Activity 1997-2002[3,4]

Year	M&A Activity
1997	Shell and Texaco entered into a joint venture to merger their marketing and refining forming Motiva and Equilon (the acquisition of Texaco by Chevron in 2001 dissolves the JV).
1998	British Petroleum acquires Amoco Corp. and becomes BP Amoco
1999	Exxon merges with Mobil and becomes ExxonMobil
1999	Total merges with Petrofina, it is called Totalfina
2000	BP Amoco acquires Atlantic Richfield (Arco) and names itself simply BP
2000	Totalfina merges with Elf Aquitaine and renames itself Total S.A.
2001	Chevron acquires Texaco (it also later acquires Unocal)
2002	Continental Oil Co. (Conoco) merges with Phillips Petroleum forming ConocoPhillips

In my opinion the big crew change began in with the M&A activity of the late 1990's and early 2000's. There was a lull as the oil price performed above average from 2004 -2013. But, the oil price has dropped again and is now below the inflation adjusted 60-year average. And, while this time the M&A activity is not happening to a great degree, yet, the majors are again shedding staff. Naturally, the higher paid staff are tending to go first and this usually includes the most experienced staffs.

Table 2 shows my own experience concerning downsizing in my particular engineering discipline for both the late 1990's and the recent 2014-2016 period. While this is a micro perspective I think it is indicative of the general trend. On a ratio basis the two periods look similar however, the starting

[3] https://en.wikipedia.org/wiki/Big_Oil
[4] https://en.wikipedia.org/wiki/Motiva_Enterprises

points in terms of headcount and years of experience are different. Furthermore, the type of experience is different.

I the late 1990's all the staff had core oil and gas project and operation experience, and those who remained after the M&A activity had core oil and gas operating experience. In the latest round most of the staff came by way of manufacturer and service company experiences. There is absolutely nothing wrong with that, however, the point is that even experienced hires with no prior "operating company" experience will require some onboarding.

Table 2 Personal Experience of Downsizing Periods

	Parameter	1997-2002	2014 -2016
Before	Headcount	7	9
	Years of Experience (YOE)	180	230
	Average YOE	26	25
After	Headcount	3	6
	Years of Experience (YOE)	65	95
	Average YOE	22	16

Approximately the same reduction of experience was experienced in the 1998 and 1999-time frame. However, when the entire period is reviewed, based on an average years of experience, an approximate reduction of 60% in experience has been realized between 1997 and 2015. Bringing everything forward to 2016, the current situation is that there are not enough senior staff to onboard new hires. I have heard from more than one major on the list that their current (recently reduced) staffs our fully engaged. Any extra work or projects will leave them needing to seek outside service company and consultancy support. And if the majors decide to staff-up there will be need help in the onboarding.

I contend that onboarding of engineering and scientific staffs circa 2017-2018 will need to be handled by dedicate technical onboarding staff. However, current staffing level have fallen too low to cover this important part of the landscape. What I am proposing is that recent retirees serve as onboarding agents in order to ensure that newly hired engineers and scientist have the attention they need while they develop their early career technical knowledge. This can significantly close the onboarding gap and allow oil companies to grow at limited expense. It can also be advantageous for the new hire engineers as they can feel more comfortable to bother someone who is specifically assigned to the task rather than their boss or other already very busy senior staffers.

Dedicated onboarding agents could also spend the time to document meaningful statistics about trends and deficiencies that might need to be addressed with more formal training. Also, dedicated onboarding agents can provide better feedback for hiring managers and HR personnel. This can help optimize the hiring process to find and retain engineers and scientists that create the greatest value for the company. With a possible shortage of engineers and scientist available and wanting to work in the rather up and down oil sector, optimizing the hiring process to get and retain the best talent will be very important.

Although there may be other ways to subdivide the engineering disciplines, Table 3 is a good guess at how to approach it. First put the engineering disciplines into engineering sectors, which are broad enough to generally cover an engineer's career from start to finish. Second, provide enough onboarding agents to cover the topics. Some of the disciplines are more core and some more of a specialty.

Core disciplines will require more interaction early in an engineer's career. Specialty areas may only need a basic introduction during the onboarding process. The onboarding process should be at least a one-year period and may need to be extended to 2 years. Based on onboarding agents being capable of covering more than one discipline / specialty, and given that the onboarding work is periodic, the 20 individual engineering disciplines and specialties might be accommodated by as few as 2.5 full-time employee equivalents and at a higher efficiency than depending on existing senior staff.

Table 3 Engineering Sectors, Disciplines, and Specialties

Engineering Sectors	Instrumentation Control and Electrical	Process and Process Safety	Civil, Mechanical and Structural	Production, Reservoir, and Geoscience
Engineering Disciplines and Specialties	Safety Instrumented Systems	Process Safety	Mechanical Eng. Piping, Vessels and Valves	Res. Eng. and Geotechnical
	Automation	Process Eng.	Rotating Equipment	Production Eng.
	Metering and Measurement Systems	Chemical Eng. and Phase Behavior	Pipelines and Structures	Reservoir Fluids and Thermodynamics
	Tele-communications	Process Efficiency and Debottlenecking	Metallurgy and Materials	Surveillance and Optimization
	Electrical Eng.	Fire and Gas	Corrosion	Enhanced Oil Recovery

Appendix A

Table 4 Employee Count before and after Mergers for Major Oil Companies

Company	Max. between 1997 and 2003	Now (2015)
Exxon	80,000[5]	73,000[6]
Mobil	43,000[7]	41% reduction
Royal Dutch Shell	119,000[8] *	94,000[9] 21% reduction
Chevron	31,000[10]	50,000[11] 25% reduction
Texaco	29,000[12]	
Unocal	6,400[13]	
BP	56,000[14]	80,000[15] 32% reduction
Amoco	43,000[16]	
Arco	18,000[17]	
Total	73,000	96,000[18] 21% reduction
Petrofina	14,000[19]	
Elf	34,000[20]	
Conoco	20,000[21]	30,000[22] [23] 48% reduction
Phillips Petroleum	38,000[24]	
Total	604,000	423,000 36.2% reduction

* Based on 2003 employee count when the JV with Texaco took full effect.

[5] https://commons.wikimedia.org/wiki/File:Exxon-Mobil_pre-merger_scope_(1997_data).png
[6] http://www.statista.com/statistics/264122/number-of-employees-at-exxon-mobil-since-2002/
[7] https://commons.wikimedia.org/wiki/File:Exxon-Mobil_pre-merger_scope_(1997_data).png
[8] http://www.nioclibrary.ir/free-e-resources/Shell%20Financial%20and%20Operational%20Information/shell_foi_complete.pdf
[9] https://en.wikipedia.org/wiki/Royal_Dutch_Shell
[10] http://www.nioclibrary.ir/free-e-resources/Cheveron%20Texaco/Cheveron%20Annual%20Report%202000.pdf
[11] https://www.chevron.com/-/media/chevron/shared/documents/annual-report-supplement-2015.pdf
[12] http://media.corporate-ir.net/media_files/irol/13/130102/reports/2000_texaco_supplement.pdf
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[21] http://money.cnn.com/2001/11/19/deals/phillips_conoco/
[22] http://www.conocophillips.com/investor-relations/company-reports/Documents/SMID_394_IR_CompanyReports_AR_Archive_2011_Print.pdf
[23] Based on 2013 data before ConocoPhillips and Phillips 66 split
[24] http://money.cnn.com/2001/11/19/deals/phillips_conoco/