Notes and Comments

Software Development Training and Nigerian Content Development

By

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Abstract

The oil and gas industry is heavily dependent on software for facilities design and operation, database management, reservoir modelling and surveillance, production simulation and optimization. Software packages are required in the upstream, midstream and downstream sectors of the industry as well as production accounting, business and environmental impact modelling. In this regard the Institute of Petroleum Studies (IPS) has taken steps to domesticate Petroleum Engineering software development to enable Nigeria Content Development initiative targets realized in the area of software development and application.

Introduction

The Institute of Petroleum Studies (IPS) is an international graduate school established through collaboration between IFP School Paris and the University of Port Harcourt in partnership with industry. The collaboration with IFP School, which is a foremost European post graduate school in oil and gas technology, has enabled the Institute to leverage on the international experience of IFP School. The IFP School is an industry-oriented postgraduate school. It is a subsidiary of the IFP organization which has an impressive profile[1]. The partnership with industry is an innovative co-operation mutually beneficial to industry and the University[1]. Industry, the beneficiaries of the products (i.e. the graduates of the Institute) is active in the programme life cycle of the Institute – from curriculum development to course delivery, field/laboratory visits, software application, field case studies, project supervision and evaluation. Industry is uniquely active in the Advisory Board of the Institute as well as the Research Advisory Board to advise the Institute to engage in industry-relevant applied research.

The Institute also collaborates with national and international professional bodies such as the international Society of Petroleum Engineers (SPE), Nigerian Environmental Society (NES), Nigerian Society of Engineers (NSE) and the Nigerian Institute of Safety Professionals (NISP). Through these bodies, the Institute presents our students to international professional certification examination. Thus, our students receive International Well Control Forum (IWCF) (Europe), National Registry of Environmental Practitioners (NREP, USA), NISP (Nigeria). The oil and gas sector is the engine that drives the Nigerian economy, providing the bulk (about 90%) of total revenue as well as the foreign exchange earnings for the country. However, despite the huge investments made by the Federal Government of Nigeria in this sector, an average of $10 billion per annum, its contribution to the Gross Domestic Product (GDP) has been very minimal. This can be attributed to the low Nigeria content in the industry. One of the major aspects of Local Contents Initiative is Software Development and Training.

Software Development and Training at the IPS

State-of-the-art industry software packages are available through software solutions companies. There are also in-house corporate software. There is room for the development of efficient software and in some cases incorporating Niger Delta petrophysical and fluid property (PVT) models. Economic software need to be domesticated to incorporate Nigerian Petroleum Profit Tax, fiscal regimes, operating systems and models.The Institute of Petroleum Studies has developed a number of software packages as part of our applied research objectives (see Table 1). These software

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[1] IFP School Brochure, www.ifp.school.com

packages provide innovative solutions to oilfield challenges, thus improving productivity and optimizing profitability. These packages are also very user friendly. Some of these packages are being used in the industry while some others are undergoing the process of validation and evaluation.

Most of the training modules have state-of-the-industry software such that our graduates are operations-ready when they are engaged by industry. Recently, the Institute has set up a programme for software training that will run modules of commercial software in the different sectors of the industry (see Table 2).

In software training, apart from productivity software such as word processing, database management, presentation and programming software, our students receive professional state of the industry software training from industry experts. A list of software on which our students receive training is given in Table 1. Some current software packages used in the petroleum industry are given on Table 2. Figure 1 shows Flash/Welcome Screens for IPS Software Solutions. Some of these software packages are rented, some are purchased and some are developed in-house. Thus, IPS has a rich library of industry software, which is now made available for open training through our software training centre[2].

There is a pool of local talent that can be tapped to engage in software development targets within the context of the Nigerian Content Development. In 2006, IPS organized a conference on Software Engineering and published a Technical Transaction on the challenges of Engineering Software Development[3]. This publication presented some software developed by Nigerians in the petroleum industry.

The Way Forward
Recently, in the Guardian of April 23, 2009, the Director General of the the National Information Technology Development Agency (NITDA)[4], Professor Cleopas Angaye revealed that Software Parks will be developed to create a conducive atmosphere for the development of software. This, if implemented faithfully will create our own Silicon Valley that will contribute to Nigerian Content Development (NCD).

The objectives of the local content policy are : to promote a framework that guarantees active local participation without comprising standards, to promote value adding in Nigeria through utilization of local raw materials and human resources and to promote steady, measurable and sustainable growth of Nigeria content. It is obvious that Government effort alone may not achieve these objectives, especially in software development and training. It is commendable that about 200 Nigerian Engineers as at year 2007 were trained in HYSYS and Plant Design Management System (PDMS) since the inception of the NCD[5]. This is actually a far cry to the number of Engineers that should be

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[2] IPS Uniport Newsletter, Vol. 4, No. 1, April 2009, p18-19

[3] Kuye, A. O., Ajienka, J. A., Awotua-Efebo, E. B., Nwachukwu, E. O., Owolabi, O., Ikiensikimama, S. S., Egbe, T (2006): IPS Technical Transaction on Software Engineering, Vol. 1, IPS Applied Technology Series, University of Port Harcourt, Nigeria, 150pp.

[4] Guardian of Thursday April 23, 2009, p21

[5]Adisa Adetoun (2007): "Information Technology Funding and National Content Development" Organized by NAPIMS, Sept 21, 2007.   www.itan.org.ng/napims%20papers%20by%20Mr%20Adisa%20Adetoun.doc

trained yearly in such software packages. This development had only been achieved in the area of software training and not software development. Therefore, concerted effort should be made in software development as part of the drive for NCD by way of setting clear guidelines for software development initiatives.

Collaboration among software solution providers, computer hardware companies, the Computer Association of Nigeria, Institutes and Centers will create the vital synergy that will fast track software development and application. Software developed should be used in training students as part of the evaluation process. There should also be a deliberate policy of making all commercial software used in the country to be made available to petroleum engineering schools to train students. This should be mandatory.

The Schlumberger Nigeria Limited established a Regional Training Center at the University of Ibadan and also donated PETREL licenses to some schools including IPS and the University of Port Harcourt. This token needs to be encouraged and sustained. Multinational companies know that the synergy with higher institutions is relevant and mandatory in product marketing. Graduate students can play active role in software development and evaluation.

Conclusions
As part of our contribution towards the Nigerian Content Development, the Institute of Petroleum Studies has developed a number of software solutions to petroleum industry problems. A Software Development and Training Centre has been established in the Institute which also carries out software evaluation and certification.

The design and operations in the petroleum industry are highly dependent on the use of state -of-the-art software. Therefore, for effective Nigerian Content Development, there is the urgent need to encourage the development of software. Government should make it mandatory that all commercial software packages used in the oil and gas industry are made available to petroleum schools. Setting software development and training targets will go a long way to achieving the laudable objectives of the NCD drive.

Table 1: - IPS Software Solutions (*iSS*) for the Petroleum Industry

S/N	Software	Areas of Application
1	**WELL ENGINEERING** WellCompSel CasDes	 Completion Selection for multilaterals wells Casing Design Software
2	**RESERVOIR ENGINEERING** i Test RE Manager	 Well Test Interpretation Software Reservoir Management
3	**PRODUCTION ENGINEERING** WelcomePE/ BASIC WelCOM WellSurv Wel Hist Demulsiscreen i Temp PipeDes	 Well Completion and Performance evaluation Real- Time Monitoring of Well Impairment using Well head Production Data Well History Summary Demulsifier Screening, Ranking and Selection Prediction of Temperature Profile in Oil Wells Multiphase Pipeline design
4	**GAS ENGINEERING** GasWelUnload©	 Predicting Liquid loading in gas wells
5	**OTHERS** Well Tracker PVTSoft 2.0	 Automated Oil Well Surveillance Software for PVT Analysis

Table 2: Some Current Software in the Petroleum Industry

S/N	SOFTWARE	AREAS OF APPLICATIONS
1	FAST WELL TEST	A user friendly software for well test analysis, (Gas, Oil or Water) interpretation.
2	GASWAT/OILWAT*	For material balance calculations in oil reservoirs with gas cap & water influx. Also use graphical methods to calculate original oil in-place & aquifer constant
3	System Analysis Model (SAM)	Used in production optimization design
4	SAPHIR*	Used for reservoir well test analysis and interpretations
5	PAYZONE DRILLING SIMULATOR	It simulates the drilling of an oil or gas well by calculating the rate of penetration & wear of the drill bits as a function of the rock being drilled.
6	CMG	Reservoir simulator used to simulate isothermal Darcy's flow in three (3) dimension
7	TOPAZ	Software for production forecasting using decline curve Analysis
8	ECLIPSE*	Used for reservoir simulation of PVT data and black oil.
9	PETREL*	An all encompassing package for reservoir simulation, well Engineering.
10	PERFORM*	Used for well optimization & productivity and for IPR performance evaluation.
11	FAST VOLUMETRIC	Used for volumetric calculation of oil and gas initial in-place. It uses rock properties & initial volume factor.
12	FAST PIPER	Used to account for wellbore deliverability forecasting to gathering system forecasting incorporating the reservoir, wellbore and gathering system effect.
13	WINGLUE	Production software used for Gas lifts optimization in oil & gas wells.
14	AUTOMATE	Reservoir analysis software used for well test analysis and interpretation.
15	SS2000	Production package that helps in controlling & checkmating sand production in oil wells.
16	WORKBENCH	Used in production decline analysis.
17	HYSYS*	Used for well planning and completion design software, process simulation and design
18	PDMS	Multidisciplinary Plant design Management Software for maximum productivity,
19	CRYSTAL BALL*	Used for Petroleum Economic Analysis

*software used by IPS students

Continuation of Table 2

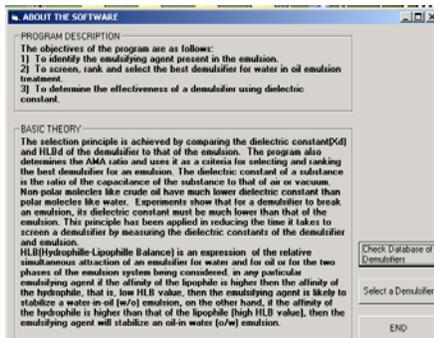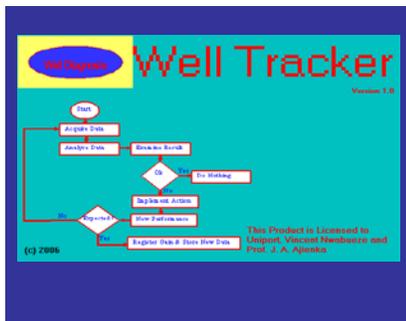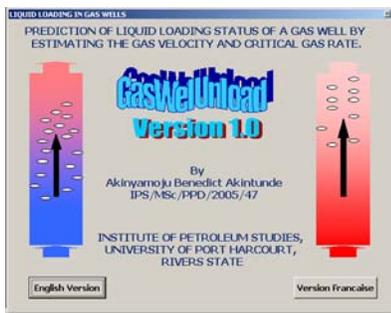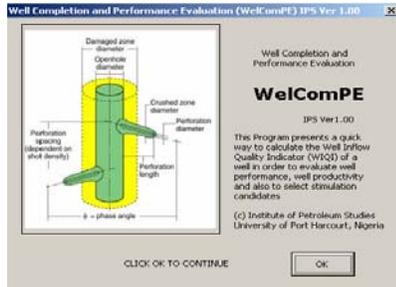| S/N	SOFTWARE	AREAS OF APPLICATIONS
20	Fast CBM (Coalbed Methane Reservoir Analysis)	Estimates reserves and generate forecasts for new play. Analyze production and pressure data for producing
21	Aspen Flare System Analyzer	Enables engineers to perform steady-State design,rating,or debottlenecking of single or multiple flare and vent systems
22	Fast Virtual Wellbore Optimization	Optimize your wellbore for single and multiphase flow with various flow paths and operating conditions
23	Aspen Hysys Pipeline Hydraulics-PIPESYS	Integrates powerful capabilities for single and multiphase pipeline flow modeling
24	Fast Vali Data	For data preparation and reporting, import large data files, generate pressure data reports and perform gradient analysis
25	Emeraude *	Kappa Software for interpretation of PLT surveys

Well Test Interpretation Software

Fig. 1: Flash/Welcome Screens for IPS Software Solutions