

**Society of Petroleum Engineers
Annual Conference and Technical Exhibition¹
Houston, October 2004**



85th anniversary of Earl Halliburton's company²

Highlights & themes

With a reported 10,482 in attendance (the largest since the early 1980's), 500 papers and 350 exhibitors, you would have thought that the Annual Conference and Technical Exposition of the [Society of Petroleum Engineers](#) would have been buzzing. It wasn't. Maybe it was the Houston location, which paradoxically, makes it easy for folks to sign up, but stay in the office, or just make a brief appearance. Maybe, with oil breaking the \$50/bbl barrier, folks were suddenly too busy to make the trip across town. In all events, the exhibition area remained quiet for the duration of the show.

While 4D time-lapse seismics is now a widely accepted technology for production optimization, the same cannot be said for real time. Although interest (and hype) in the 'e-field' or 'i-field' abounds, take-up of real-time production technologies is not as fast as most expected a couple of years ago. This is partly because of the complex, interdisciplinary nature of the simulation – optimization – production control loop. These techniques are stressing the 'silo' boundaries in oil companies. The contractors' own organizations also make it hard to know exactly who is in charge of real time technologies. But real time operations centers have come of age in drilling and production is undoubtedly next. The components are already there, from sophisticated valves, multi-phase meters to optical sensors and actuators. Oh and software of course, boatloads of it.

In the software field, we noted a brand new 'seismic to simulator' interpretation suite from [JOA – Jewel](#) – a spin-off from Shell's .NET migration. A lot of consideration is being given to the data avalanche from real time production systems – with data historians (from [OSIsoft](#)) and data mining from [Schlumberger](#). Marriages are in vogue – with Landmark and Weatherford's [E-Production Solutions](#) teaming up in one corner – and with Schlumberger and [Aspen Technology](#) in the other. But much petroleum engineering software does not come from the main vendors' software units but from

¹ See also the [2004 SPE ACTE home page](#).

² Image courtesy Halliburton – note Houston streets haven't changed.

deeper down inside the wireline or production tools parts of their own organizations. Elsewhere, much software is delivered by, or attached to, specific tools or services (chemicals, waste disposal...), making the integrator's job interesting.

In the simulation arena the offering is getting extremely granular – with companies offering high-level optimizing toolkits which run simulators from major vendors under the hood. Elsewhere independent vendors are applying techniques like streamline and network modeling to simulate various parts of the production system. Optimization itself can take place at many scales – from perforations to portfolios. ECL (originally behind Schlumberger's Eclipse) is back with a new reservoir simulator [TechSim](#).

Highlights

[Real Time](#)

[4D seismics](#)

[CAD-based reservoir modeling](#)

[Google search appliance](#)

[JOA Jewel – new seismic to simulator suite](#)

[Weatherford EPS and Landmark](#)

[Zebra's 1½TB Hologram](#)

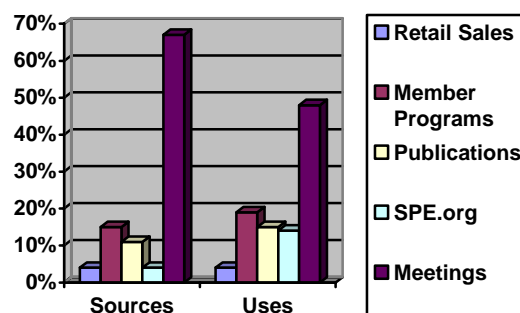
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SPE President's address

SPE income is \$13 million. The SPE website spe.org is now breaking even. Membership at 60,000 is an all-time high with 50% from outside the USA. The SPE is 'restructuring' the organization with a holding company in the Netherlands and 7 sub-units. Schlumberger pays for e-library subs for universities with an SPE chapter³. A board-level committee has been set up on internet services. Abstracts and manuscripts are now available on line and 1,700 papers were added to the e-library.



Sources and uses of SPE funds⁴.

Inter society collaboration takes the form of a virtual student exposition (along with two other societies), the [IPTC](#) conference (in Qatar) with the EAGE, SEG and AAPG. Europec has consolidated with the EAGE's Madrid conference and a joint search across SPE, EAGE and SEG papers is now possible. The SPE is mooting (pilot program) for certification. Also a new 'long range plan' is underway – contact Eve Sprunt (or comments to president@spe.org.) The new president is Giovanni Paccaloni (ENI).



Paccaloni

Papers⁵ – Information Technology

Information system optimization – Dumont et al., Total (SPE 89915)

Dumont described IT use in operations to visualize huge data volumes and 'turn data flow into cash flow'. IT also helps on construction handover and in production – for technical document management including company rules, risk-based inspection and

³ Why the SPE, whose raison d'être is education, is charging universities in the first place is unclear.

⁴ Source [SPE](#).

⁵ The abstracts of papers presented at the SPE ACTE are available on [CD-ROM](#) from the SPE.

‘reliability control and maintenance’ (RCM) methodology. Total’s STEP program has deployed a standard desktop to 10,000 upstream users.

Total’s ‘SMART’ strategy

SAFE – same application for everyone

Market – buy not build

Application – used by other operators – share development costs

Reversibility – need to be able to remove and replace a component (multi-vendor solution)

Technically

Simple – Easy to install, customize, use and maintain.

Dumont said – ‘this is not a dream’ – but a very productive data management solution handling G&G, surface installations, drilling and other domains. IT infrastructure includes a worldwide application catalog, standard IT services and supports a standard desktop. Lessons learned – process layer is critical, change management, training, user involvement. Applications must have potential to evolve. The future will see better integration.

Q&A

What’s the integration platform?

Open Spirit⁶

Operations people find that corporate solutions don’t filter down. Real data doesn’t get to end users. Reversibility is a good idea because clients have entrenched solutions, not open systems. Those who say they are not developing – often spend their time writing Excel macros! Corporate solutions are not doing the job. Are your solutions really working?

Yes, we have good data flows from remote operations on our Syncor operations – collaboration between G&G and RT data from this mature field to Caracas. Users can connect from home.

Halliburton’s Taxonomy – Dave Smith, Landmark Graphics (SPE 90006)

Smith described work on HalWorld – an internet site which was suffering from lack of management and ‘categorization’ of content. This led to delayed update and unsynchronized content. Halliburton looked to taxonomies – and found some ‘great examples’ notably www.sears.com, www.jcwhitney.com and www.1800flowers.com. Another ‘excellent’ taxonomy is deployed by NASA on <http://nasataxonomy.jpl.nasa.gov>. Oil and gas industry projects (POSC, PPDM) are still in the early stages. Halliburton chose the [Interwoven](#) content management application to organize its taxonomy across logging tools, HP, SAP, etc. University of Tulsa abstracts and the POSC/PPDM work was also leveraged in the project. Halliburton still uses Microsoft Word and Excel – but publishes through Interwoven to the intranet. Other tools include Interwoven [MetaTagger](#) and the [Plumtree Portal](#). Halliburton has 12 main ontologies for subjects like location, document type, E&P lifecycle position, business process (re HMS systems). The content management systems (CMS) handles publishing to the web (myHalliburton.com). There are 30 content ‘owners’. Search now embeds taxonomies.

⁶ *It is hard to see how Open Spirit’s limited data types can support corporate IT in the way Dumont describes.*

Q&A

How does it compare with Google?

Google is a great search engine – but it is biased towards where the majority of people go to.

What about establishing vendor neutral taxonomies? POSC and PPDM are driven by members – they're not necessarily neutral.

There is a growing interest in this – but Halliburton had a need and decided to do this for itself.

Real time and reservoir management

Real time optimization and assessment – Cramer, Shell (SPE 90213)

Ron Cramer, Shell Global Solutions, described work done in the Real Time [Technical Interest Group](#) (RT-TIG). Looking at published literature – case histories were compiled, analyzed and presented in the form of lessons learned. The existing RT toolkit is not very well understood, its value is hard to measure and there is too much of a focus on technology. A spider diagram shows, for each project, the degree of RT-enablement. Can be applied to a well, field or asset. Also did NPV profiles with and without RT Optimization (with made-up data!). Expected benefits include ‘less people, less beds, less capex and a better NPV profile. From the 23 case studies, a value of between 4-10% of capex was observed from the application of RTO.

Real time planning challenges – Mike Mitchell, Data Horizons

An instrumented oilfield collects a million values every day from multiple sources and a variety of hardware and software. A variety of communication protocols are used including Modbus, SQL, OPC etc. Firewalls, data feed interruptions (due to the operational environment) all mandate careful planning for successful IT deployment.

Q&A

Have you looked to other industries for their experiences in industrial automation?

Yes – there are obvious analogies with real time monitoring of factory processes and refineries. Data logging with a historian developed out of the large systems used in manufacturing.

Data acquisition seems to be high cost – what is the position for marginal wells?

Most value lies in the marginal wells. The data historian is an investment hurdle – but this is a scaleable solution. SCADA is no big deal today – you can capture meaningful SCADA data with a handful of devices.

Data volumes look rather large – do we need to sample so frequently?

Data comes in at one second intervals. We can filter this down to what people will use (kalman filtering)– but we're not very good at doing this. Data management experts point out that storage is cheap. Data can be managed by exception – or you just keep everything.

These data volumes are really rather small compared with other fields – seismics or logging. Maybe you should look to other parts of our industry for help with data management.

Production data mining in Kern River – Popa, ChevronTexaco (SPE 90226)

100 years of production history 95kbbbl/day out of 8000 producers and 1200 injectors. Engineers noted that many high producers were surrounded by low producers. Also looking for by-passed oil. But with over 1200 wells per engineer – no time for in-depth analysis. Deeper wells also seemed better producers. Wanted to check this out but avoid heavy duty reservoir study. So opted for a data mining approach. Input was well ID, completion info, zone data and production/test data. 50% of wells produced less than 3 ½ bbl/day. Plots of pump depth vs. production showed ‘the lower the better’. Mapping failed to show a trend, but once shallower wells were removed, areas where the lower sands were not drained could be seen. Inner liner completions appear worse than through casing completions (work in progress). Next Popa used a neural network model – with back propagation to estimate oil production from all drainable sands. Cost and risk of workover type (clean, lower pump, add perforation, sidetrack) were also considered. 15 wells have been recompleted following the study. Production has typically risen from ~5bbl/day to 10 to 20. Such ‘lucrative’ preliminary results have triggered expansion into a field wide in depth reservoir study.

Q&A

What tools for Neural Nets?

[Ward Systems](#)’ NeuroShell for Neural Networks. The fuzzy logic was developed in-house.

Is the POSC Epicentre mode still in use on Kern River?

(Unclear) – ‘The model is compliant in parts’.

Future trends in reservoir testing and permanent monitoring

Rene Alvaro introduced this session by noting the ‘big changes’ happening in reservoir management using modeling and observations to control production. RT reservoir evaluation is carried out with underbalanced drilling and used to control UBD parameters. The future will see more measurement and more user-friendly models accessible by domain specialists.

Wireline formation testing – Hashem, Shell

Hashem (from the Shell FEAST⁷ team) described reservoir characterization with wireline formation testers (WFT) saying there was a natural resistance to new measurements – comparing the situation with the early days of horizontal drilling. WFT gives almost as much depth of investigation as a DST.

A downhole PVT lab – Sami Bustami, Schlumberger

Well testing requirements vary with phases of operations. In exploration, testing provides fluid characterization for facilities design. In development it refines the reservoir model and in production, testing monitors water or gas breakthrough. The exploration phase will benefit particularly from technologies which enable downhole measurement of H₂S, pH, dewpoint, density and viscosity. Schlumberger’s dream is to ‘put a PVT lab downhole’. For development, a new behind casing testing tool is being introduced at the show – designed for very low permeability reservoirs. Here

⁷ Fluids and Testing Experts.

Schlumberger's dream is 'continuous permeability measurement'. In production, the focus is on what flows come from where with the FSI FlowScan Imager.

Permanent monitoring of steam flood – Kemshall, PDO (Shell)

Smart fields 'link data asset to the value loop'. RT permanent monitoring with a permanent downhole gauge is used for hydraulic fracturing and seismic monitoring. DTS⁸ gather during steam pilot – shows growing steam zone. ESP – drop in borehole temperature correlates with a drop in production due to injection water breakthrough. IT is the key – web based data give holistic view of all aspects of field development.

Use of Schlumberger CHDT – Norris, EnCana

Monitoring pressure communication in tight fluvial sand NW Colorado (Piceance Basin). Gas is 'everywhere,' EnCana uses science to identify economic plays in these discontinuous sands where inter well communication is 'a challenge'. The Schlumberger [cased hole dynamics tester](#) (CHDT) drills a little hole through casing, does a test and then plugs the hole. This typically produces 20ccs of fluid from a very tight formation – with 0.06 mD permeability. CHDT has proved 'an attractive tool for monitoring pressure in a timely manner'.

4D time lapse seismics

Constraining complex model with 4D seismic – Pannett, Shell (SPE 89793)

Describes study of the Mari B reservoir in New Zealand. A synthetic seismogram was generated from the reservoir model and an impedance difference map compared with 4D seismics. 4D markers were imported to the dynamic model to create 9 cases – gas/water, oil/gas, etc. Compaction was neglected in this well-consolidated sand with little or no pressure drop.

CO2 Injection Weyburn Field – Yamamoto, Colorado School of Mines (SPE 90532)

CO₂ produced by coal gasification in Dakota is piped 300km into the Canadian Williston Basin where it is sequestered in the depleted Weyburn field, discovered in 1950's. Three 3D/4C '[Reservoir Characterization Project](#)' seismic surveys have been conducted by EnCana.

4D seismic history match – Gioia Falcone⁹ (SPE 90466)

Describes History matching Using Time-lapse Seismics (HUTS) on Total's Girassol field. A 3D baseline survey was acquired in 1999 and repeated in 2002. Petroelastic modelling study from logs and cores was performed to predict the time lapse effect.

4D integration with production data – Mezghani, IFP (SPE 90420)

Production data gives info at well location. 4D seismics gives good interwell information. Need tools and methods to integrate 4D seismics, production data and simulator. History matching is widely used for reservoir management. 4D is used qualitatively and independently of production. The IFP is working to combine well

⁸ Distributed Temperature Sensor (fiber).

⁹ Total Geoscience Center London.

flow and pressure data with seismic impedance differences by modelling fluid flow and petroelastics to predict impedance changes.

Other papers of note

Real time smart well optimization – Aitokhuehi Stanford University SPE Student Paper

Described the combined use of history matching and valve optimization (VOHM).

Statoil's first onshore [drilling] support center – McCann et al. (SPE 90367)

Statoil's Onshore Support Center (OSC) opened its doors in December 2003. The center is linked with high bandwidth video and data links to offshore Halten and Nordland fields. The OSC uses the [WITSML](#) data transfer standard for data links to the field. The project was first used on well planning – Statoil's jTarget project evolved into a commercial tool – PrecisionTarget, marketed by Landmark Graphics. McCann presented case studies of uses of the OSC in geosteering support, rapid geological model update and reaction to well control issues.

Data Mining for Production Optimization – Zangl, Schlumberger (SPE 90372)

A good backgrounder on mining the daily 'avalanche' of production data coming from the instrumented oilfield. Paper describes use of Self Organizing Maps to perform data QC and analyze well behavior.

Effect of REACH system on service company – Killaars, Halliburton (SPE 90386)

The EU's Registration, Evaluation and Authorization of Chemicals (REACH) policy will affect the oil and gas industry and shift the burden of proof of chemical safety from the authorities to the industry. All chemicals used in the EU (and Norway) must now be registered and evaluated for toxicity. REACH will have a significant impact on the industry.

Installation of intelligent completion – Constantine, Weatherford (SPE 90397)

Intelligent completion was deployed on Shell's EA field, Nigeria, to allow production from three reservoirs from a single well. Flow control was achieved with three remotely operated sliding sleeve valves (ROSS). These were addressable via a hydraulically controlled addressing unit (HCAU) – to switch control from valve to valve. Optical sensors for pressure and temperature measurement were deployed for each reservoir. The system is operator controlled by an operator at the surface.

First deepwater electric intelligent completion – Moriera, Baker Oil Tools (SPE 90472)

Described the 'all electric' completion of a well in Petrobras' Maril Sul field in 1180m of water. Baker's InCharge technologies contributed to Petrobras' Procap 3000 new technology program. InCharge monitors and controls flow via variable chokes – 'intelligent production regulators'. The installed system monitors and controls two producing intervals in a single 5½" string. Early equipment failures led Baker to redesign the hardware and initiate a rigorous testing program. The system was deployed in August 2003, and is now operational. Despite some remaining 'resistance' to these new technologies, Moriera believes that 'downhole oilfield operations are in the midst of a silent revolution [which is] spawning a rethink of operational practices and

culture.’ The ability to monitor and control a well from a remote location is hard to square with current oilfield practices.

Thunder Horse riser break – Kirton et. Al, BP (SPE 90628)

A great tale of a major drilling incident (a riser parted at 1,000m depth in 2,000m of water) and how BP summoned expertise from around the world to fix the problem. Paper includes a check list of how to handle a major incident.

3D Visualization, a common language for the subsurface – Telford, BP (SPE 90659)

Case history of 3D visualization use on the Andrew field in the N. Sea. Describes BP’s four ‘Common Processes’ of drilling value assurance, right scoping, no drilling surprises and technical limit. Non Productive Time (NPT) analysis was at the origin of BP’s visualization environment which evolved into Landmark’s DecisionSpace 3D visualization tool.

The value of information – Hector Wills, PDVSA (SPE 90710)

Baysean analysis of economic resource allocation using the value of information concept. Suggests a strategy for planning data acquisition. Not for the faint-hearted.

Self organizing maps for lithofacies – Stunder et al. Schlumberger (SPE 90720)

Attractively illustrated tutorial on the use of self organizing maps and backpropagation neural nets for lithofacies characterization and porosity/permeability mapping.

UN reserves classification – Ahlbrandt et al. USGS (SPE 90839)

The UN is looking to harmonize reserves classifications from SPE, World Petroleum Congress and the AAPG. The plan is to migrate these to the UN’s framework classification for solid fuel and mineral resources (UNFC). This would align oil reserves with reserves for uranium, coal and other minerals. An authoritative paper with a long list of distinguished authors.

Uncertainty and optimization of offshore gas field – Solis et al. Pemex SPE 90177

Describes use of Landmark’s DecisionSpace, VIP and [Optek](#)’s OptQuest optimizer to optimize development planning of offshore gas field.

Web-based reservoir control system – Polyakov, Schlumberger (SPE 90911)

Web-based process for smart completion design. Leverages FORTRAN executable for engineering calculations, ColdFusion Modeling Language (CFML) for business logic and SQL.

Case studies in production optimization – Leshchyshyn, BJ Services (SPE 90848)

Describes use of vendor and publicly available data from a variety of sources in the Western Canadian Sedimentary Basin (WCSB). Data was collected into the Public Petroleum Data Model’s Association’s PPDM data model.

Recurring mistakes in reserves estimates – Harrell et al. Ryder Scott (SPE 91069)

Paper describes a variety of dumb and not so dumb mistakes made in reserve estimation. These range from confusing top of formation with top of pay – through poor estimates of decline rate – to ‘incomplete understanding’ of commercial economics software.

Real Time Production Optimization Technical Interest Group

Optimization including subsurface is immature. Hiatus since 2002. Starting over. Luigi Saputelli, Toshi Mochizuki (XOM). RT optimization see the [TIG website](#)¹⁰ with case histories from public documents (and see [paper](#) by Cramer above). The TIG connects some 70 members who would like increase EU participation. The TIG plans to continue to review key technologies through case histories, in depth review of people and process, enrich guidelines, best practices – justification, value determination and methodology. But TIG members are puzzled as to ‘why all this isn’t happening!’ Despite the positive CERA e-field study based on interviews with Shell Exxon – and the Digital Oilfield initiative.

Exhibitors

Advantek @Frac – new frac software for soft rocks and waste disposal

Newly commercialized hydraulic frac simulation software. Special applications for fracturing of soft rocks. Used by BP to model and monitor grind and injection (a.k.a. crush and flush!) of over one million lbs of waste during Prudhoe Bay pit closure. Also being used to model sulfur sequestration in Kashagan supergiant – which will produce 8,000 tons per day of sulfur – about one quarter of the world’s consumption!

Contact Ahmed Abou-Sayed

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More info www.advantekinternational.com

Bengal Development – study on AFE-related information sharing.

Bengal¹¹ Development has conducted a study of information sharing outside the firewall – between operators and non operators. Study investigates ways in which operators can securely share non sensitive information direct from their ERP systems.

Contact Scott Howells

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Borden Chemical Exodus NPV proppant analysis tool

Borden’s Exodus NPV tool is a multiphase reservoir simulator for evaluation of proppant alternatives. Also WebQC - real time web-based proppant QA tool.

Contact Jorge Manrique

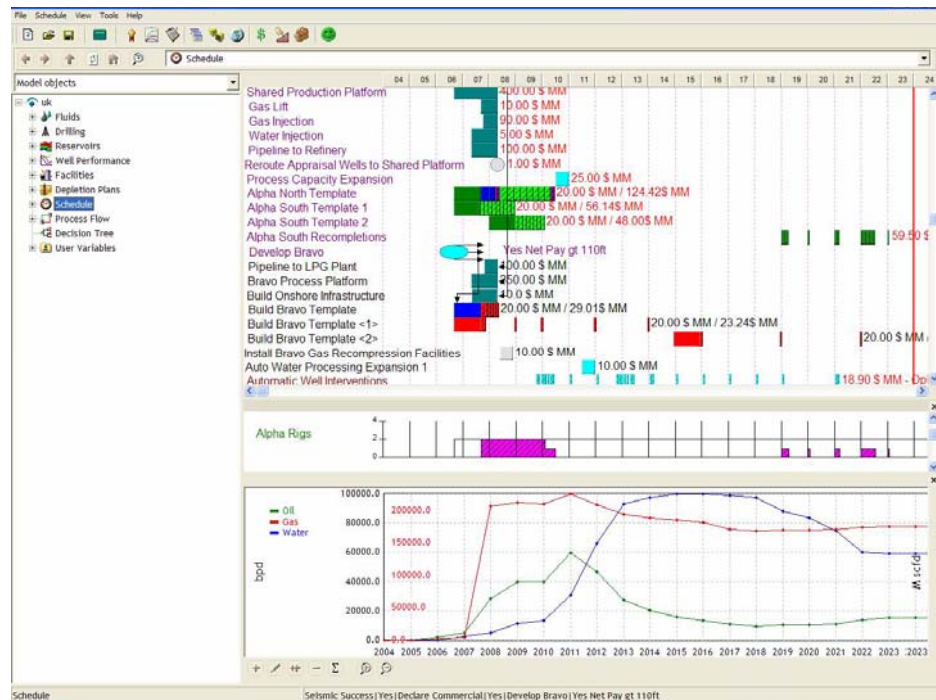
Email manriquej@bordenchem.com

¹⁰ SPE membership required.

¹¹ Bengal refers to Louisiana State university – not offshore software development!

More info www.bordenchem-oilfield.com/spe/

Caesar Petroleum Systems PetroVR 4



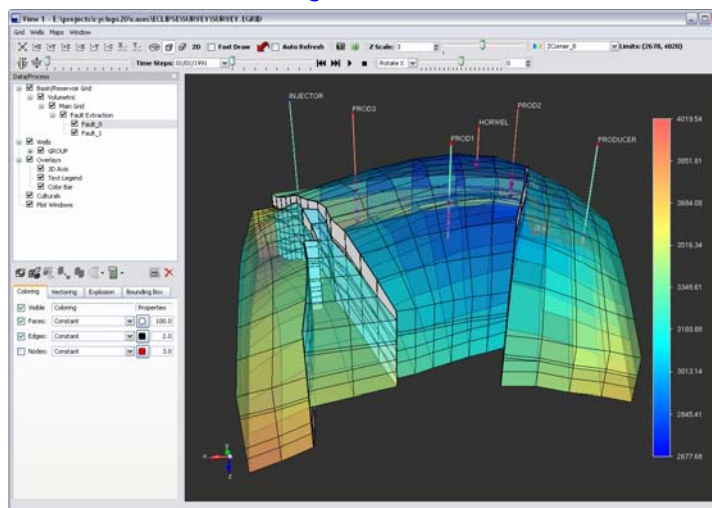
Project planning with Caesar's PetroVR 4¹²

PetroVR4 performs development planning and petroleum economic evaluation. A new TeamVR database architecture adds collaborative project management. Supports projects such as deepwater development, water or gas injection or 'an entire upstream LNG project'.

Contact Victor Koosh
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 More info www.caesarsystems.com

¹² Image courtesy Caesar Systems.

CEI EnSight Cyclops/Harpoon – CAD¹³-based modeling



Cyclops – CAD-based reservoir visualization.

EnSight unveiled Cyclops which uses EnSight's CAD and VR engine to visualize and manipulate reservoir data. The grid and well visualization tool was developed for Petrobras using EnSight's Harpoon mesher and visualization engine. Shell, Chevron and Exxon use EnSight to visualize chemical process simulations. BP uses EnSight to study oil platform explosions and wind flow patterns around oil rigs.

Contact Kent Misegades

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CMG Dynamic gridding in Gem and Stars

New dynamic gridding adapts to passage of injection front. High resolution grids are dynamically 'triggered' by pressure gradient. Also a lot of work on CO₂ sequestration – running simulators for thousands of year runs. Particularly applicable to coalbed methane (CBM) projects. CMG were 'very impressed' with simulation results on IBM P-Series eServer 550 P5 with 4 Power PC processors.

Contact Jim Erdle

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Corelab GIS Front end to RAPID core database

Corelab has built a GIS¹⁴ front end to its RAPID core database and added new trend analysis, data types (completion, PVT etc.). Corelab claims RAPID is the market leader and has doubled staff (from 6 to 12) and added lots more data.

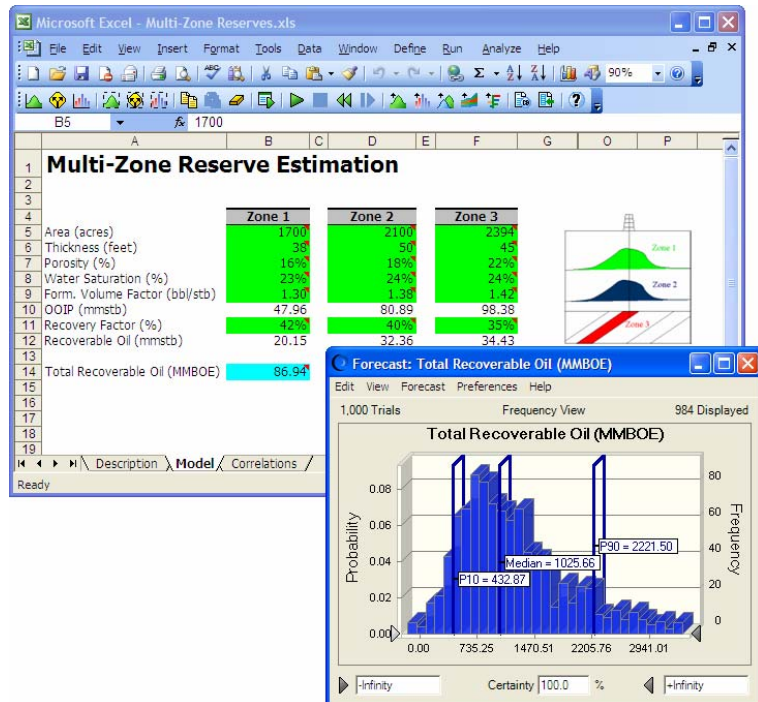
Contact Allen Britton

Email Allen.britton@corelab.com

More info www.corelab.com

¹³ Computer Aided Design

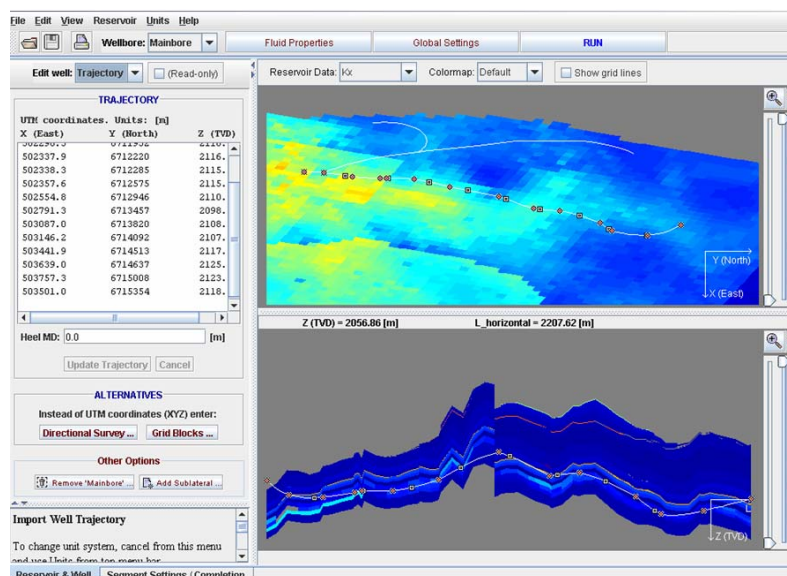
¹⁴ Geographical Information System – mapping.

Decisioneering Crystal Ball 7 – publish and subscribe collaboration*Crystal Ball 7¹⁵*

Decisioneering's Crystal Ball performs Monte Carlo simulation from inside an Excel spreadsheet. V7 brings more ease of use with a Microsoft Office look and feel and new reporting capabilities. The new release supports collaborative workflows and sharing of uncertainty distributions through a publish and subscribe mechanism. Crystal Ball is the economics engine embedded in Landmark's Aries. Used by Shell as an 'optional' component of its Global Desktop Infrastructure – GDI.

Contact Steve Hoye
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 More info www.crystalball.com

¹⁵ Image courtesy Decisioneering.

DPT US – NETool

NETool view of extended reach borehole¹⁶.

NetTool extends network hydraulic modeling to the formation with visualization of the wellpath in the context of reservoir engineering data. Users can create and investigate laterals and multi-laterals. NETool addresses production problems associated with extended reach drilling where ‘particular attention’ needs to be applied to wellbore hydraulics. Can be used while drilling, on smart wells and multi-laterals. The tool was originally developed by Thormod Johansen for Norsk Hydro.

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Dynamic Graphics EarthVision 8.0

EarthVision V8.0 will be out year end 2004. Major improvement to gridding and ‘next generation’ well planning software with on-demand model-based well planning and updating of model with LWD/MWD during geosteering. EV has sold 1200 copies. BP is a user.

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Earth Decision EDS Suite 2.1

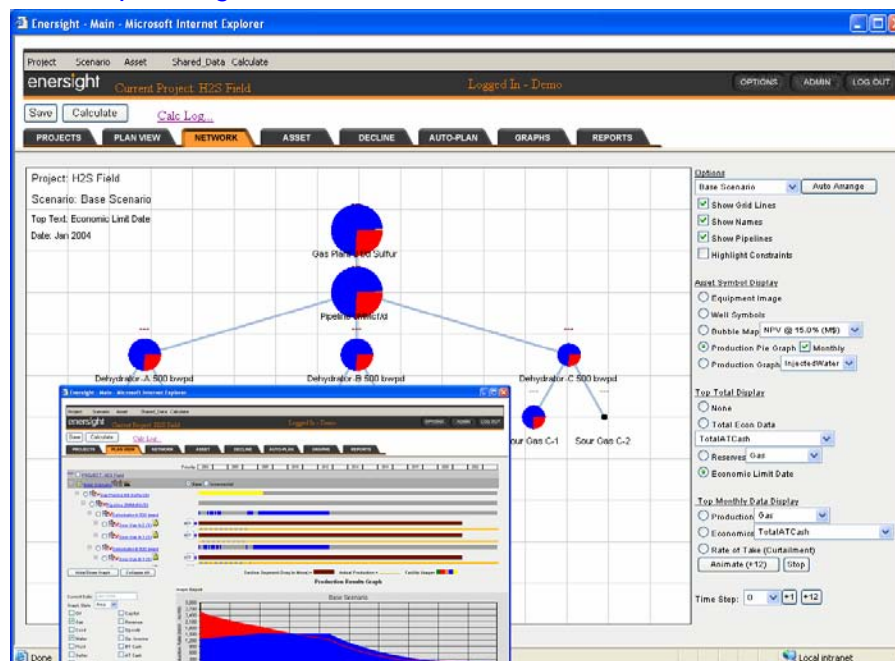
Earth Decision Science’s EDS Suite V2.1 introduces a new object simulator developed in collaboration with Total. Also new is a dynamic upscaler. Gocad has now moved from the R&D department and into critical applications with majors. An OpenSpirit GoCad plug-in is also new. A Linux 64bit AMD/HP will be shown at the SEG. Linux is ‘proving very fast’.

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¹⁶ Image courtesy DPT.

More from www.earthdecision.com

Energisight new production planning software



*Energisight Production Planning*¹⁷.

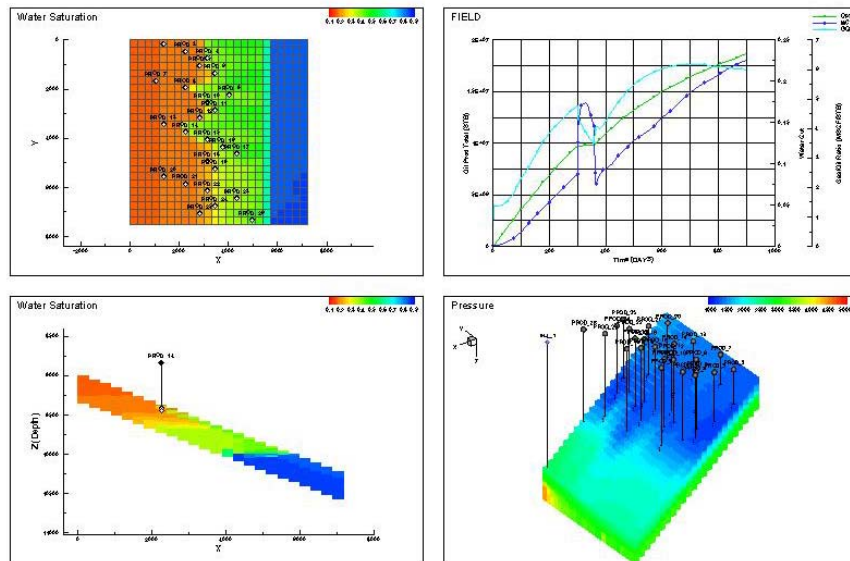
Browser-based production planning software for facility sizing, well planning etc. A holistic approach shows where wells may be able to produce to capacity because of network constraints. Allows for cash-flow optimized planning. Working from a base case, users can add incremental components and see how they affect the network. Autoplan evaluates how adding new wells can optimize production and identifies wells that should not be drilled until capacity becomes available. Energisight uses a linear programming engine to optimize project and networks. Downtime for maintenance and the hurricane season can be included with ‘statistical planning’. Beta clients testing today, commercial release January 05.

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Exploration Consultants – Maestro (IOR) and TechSim new reservoir simulator

Maestro, a software and services offering, evaluates the potential of Improved Oil Recovery (IOR/EOR) projects. Evaluates waterflood, WAG, gas injection, polymer and surfactant flooding to determine a variety of performance indicators and technical and economic viability. The tool was acquired from AEA Technology. ECL has also just begun commercialization of TechSIM, a black oil/compositional reservoir simulator originally developed by AEA Technologies. TechSIM has been used in house for some time.

¹⁷ Image courtesy Energisight.



9th SPE Grid test with ECL TechSim¹⁸

TechSim supports black oil and IOR simulation on large field models, cross-sections, pattern floods and radial coning problems. Local grid refinement allows for the representation of complex reservoir structures. The simulator supports naturally fractured reservoirs with a dual porosity, dual permeability model.

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Genesis Petroleum Technologies – Genesis Analyzer and Designer

Genesis Analyzer uses the best composite cost (BCC) methodology to analyze drilling performance. Capture data with DIMS, lots of QC. Visit web site for Talisman deal. Goal is best practice for each component of drilling – not just for overall well. Genesis Designer applies similar methods to perform predictions for new wells from historical data. Work with Anadarko presented at 2003 OTC (paper OTC 16290). CSIRO is to spin-off the Gensis unit in 2005.

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Google – Google Search Appliance



Google search appliance

¹⁸ Mage courtesy ECL.

A colorful Linux box with a Google logo plugs into the network. Web browser-based configuration tells the appliance what directories to spider. An in-house Google catalog results. Auto language detection – works with HTML, PDF, MS Office, IBM Office Suites and ‘200 other formats’. Clients include ConocoPhillips and Grant Prideco.

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Hot Button Solutions field data entry for HP iPAQ

Bespoke software for field workers using iPAQ for data entry. In collaboration with [Production Access](#).

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Hydrocarbon Data Systems HDS log analysis V4.0

Latest release includes vector (array) data computations and a new graphical application builder (using VB Script) to build ad-hoc equations for porosity calculations, rock properties etc. HDS claims that its offering is ‘services, service, service, service’ – and that product development is a joint effort with clients. These typically come from smaller independents using Geographix and Petra. Offers very attractive log plotting.

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IHS Energy – iNodes, self contained data capture devices



iNodes remote data capture¹⁹.

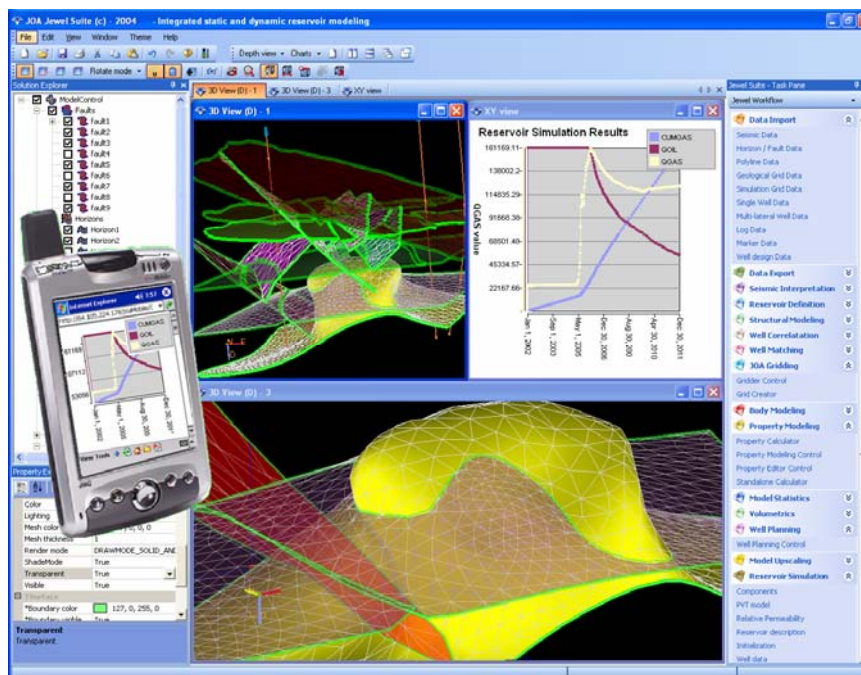
IHS Energy’s iNodes are self contained devices for data capture in the field. Devices are self-powered, wireless and come with a solar panel, bi-directional radio/satellite transmitter, and back-up battery. iNodes products include pressure monitors, flow

¹⁹ Image courtesy IHS Energy.

meters and tank level monitors. Communications devices include a compact flash radio and ModBus concentrators.

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JOA Jewel – new .NET-based seismic to simulator suite



*JOA Jewel integrated .NET software suite*²⁰

A componentized software suite to perform static and dynamic modeling from seismic through to the flow simulator. Uses web services (Microsoft .NET environment) for machine-to-machine interaction. Due to .NET architecture, it is possible to add customer ‘Jewels’ such as proprietary algorithms, data base connections or complete applications. Used by Shell to interact with proprietary fault cleanup applications. JOA’s patented technology produces orthogonal grids. Today JOA is offering a ‘technology preview’ of its .NET framework that uses ‘clustered’ graphics - software-based data clustering prior to rendering with OpenGL.

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Kappa Saphir NL and ECRIN well testing software

Kappa is repackaging its well testing and production software into a single environment, Ecrin. The first commercial release is scheduled for early 2005. Kappa’s well testing package Saphir now offers local grid refinement (3D Voronoi) for horizontal wells and a new Spahir NL (non linear) module for unconsolidated formations – taking account of fluid compressibility. Further ahead, Kappa continues to work on its full field simulator Rubis, targeting a first release in 2006.

²⁰ Image courtesy JOA BV

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NSI Technologies StimPlan hydraulic fracturing

PC based software for hydraulic fracture modeling and planning. Includes data management, fracture geometry, economics and fracture prediction and analysis. Latest release includes a new 3D finite element model and new acid frac model.

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Open Spirit Corp. GIS Integration Utilities

ArcView extension for Open Spirit – allows ArcView to send cursor location, data selection and GIS events to other OS-enabled applications. Works with OS Scan Utility which collects GIS features from other OS enabled applications.

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OSISoft – PI System and RTPortal data acquisition and management

Plant Information (PI) started out as a SCADA data historian. Used by Schlumberger. Connects with SAP and Maximo. Over 150,000 tags. PI is a ‘flat’, time-series based database – ‘not Oracle’. The software is being released as RTPortal - on Microsoft Sharepoint Server (Microsoft’s Portal technology). Offers ‘good collaboration’ and integration with GIS (MapPoint). PI has OPC²¹ interface – but also 350 interfaces to other acquisition systems. All Windows-based. PI used by Shell, BP and ExxonMobil and is ‘huge’ with Saudi Aramco. See also RTAnalytics and the RtPM Solution.

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Panasonic – Toughbook 18

Toughbook 18 offers multi-mode connectivity with Bluetooth, CDMA, GPRS, WiFi, GPS. System looks for least cost connectivity. Also uses RSA secure id card to tunnel into corporate network. Project with IBM and InforWave for ChevronTexaco for a cell network and satellite based IP hub connecting field engineers with SAP, Email and SCADA systems behind the firewall. Around 500 Toughbook 18s deployed in Pipeline unit and another 60 by upstream.

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²¹ OLE for Process Control.

Peloton WellView 8 extended to production optimization

New version of WellView adds data verification and management functions and extends WellView's use to production optimization.

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PetroSoft Phoenix R 4.4 reserves management

Phoenix reserves management solution offers audit trails, document management and approvals workflow. Imports data from Landmark's Aries, Merak Peep (RSN) and reports according to SEC guidelines. Used for SEC reporting by BP, ExxonMobil is PetroSoft's flagship client.

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Petrospec EquiPoise and pQube geopressure solutions

EquiPoise geopressure prediction and detection software with multi-well correlation. Uses LWD data in real time. pQube extracts geopressure from 2D and 3D seismic velocities.

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Production Access Inc. Field-Pro and Operations Center

Handheld production data capture for the pumper. Built in association with Hot Button. Links to PA's Production Center offering AFE management, and internet-based data collection. See also [Hot Button](#). The PA Operations Center provides 'optimized workflows for operations' – including drilling, completion and workover.

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Schlumberger's Real Time offering

Schlumberger's real time offering spans from wellbore to surface facilities for example with the VxFlowmeter and RT Production Optimization – a service-based offering. SIS is developing standardized workflows across different technologies (Rajiv Sagar is product champion). These workflow based offerings acquire, transmit data and compute KPIs and trends which are fed to decision makers in operations for action. RT measurements come from many sources – compressors, DTS, permanent pressure, pumps, ESP and other downhole devices. RT is a proved technology for well construction, frac jobs etc. In production Phase Tester provides permanent downhole flow measurements. Other production applications are available as web enabled services. For instance productivity index can be monitored to see if it degrades over

time. Also ran Well Watcher pressure gauge – ESP²² Watcher and ProductionWatcher (drawdown analysis). [LiftPro](#) ESP optimization software leverages measurement from phase tester, DTS, whatever you've got! Schlumberger is working on 'closing the loop' from ESP to downhole valves. The association with AspenTech has introduced a dynamic link from PipeSim to HySys – including economics. SIS and AspenTech are to further develop integrated solutions leveraging Eclipse, HySys and economics – Aspen Asset Builder. Schlumberger also sees a linkage between RT and gas lift – although the audience is different. PipeSim has had real time gas lift since 1998.

[Schlumberger – Hydraulic fracture monitoring](#)

There are over 50,000 frac jobs a year 80% in the US. This \$2 billion industry is set to double in the next 5 years. Hitherto hydraulic fracturing 'fracking' was monitored with a pressure gauge. Today, microseismic monitoring gives a three dimensional view of the fractures as they propagate. StimMap uses two boreholes – one for treatment the other for monitoring. Use the Versatile Seismic Imager – VSI – listens to frac noise. An 8 shuttle array is clamped to borehole and a vibrator at the surface used for velocities and to orient geophones. The system records and triangulates micro seismics pops and cracks – may be a few or few hundred events. InterAct takes data to engineers and office.

[Sciencesoft S3 Graf/Connect simultaneous use of GAP and Eclipse](#)

S3 Connect links the reservoir simulator to surface network models. Typical use involves simultaneous use of GAP and Eclipse to model rate constraints of surface network on production. The software also optimizes Eclipse license use during simulation. Sponsored by Oxy, BP and Statoil. A new 3D add-on module for S3 Graf. Uses DirectX for performant graphics.

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[Sofitral SAFE Technology](#)

Sofitral's SAFE is an 'exact, analytical approach' to deriving flow behavior from the basic physics of porous media. The technique sets out to improve on Darcy's semi-empirical approach.

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[Valley Forge XML-based documentation](#)

Technical documentation writing service and information management consulting. Uses XML Compass content management and [Arbor Text](#)'s EPIC XML editor.

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²² Electric submerged pumps.

Wavefront Reservoir Technologies – DTS pipeline leak detection

Partner with [Omnisens](#) on DTS²³ used in leak detection on pipelines. Can measure over 150km – to 1.5m accuracy and 0.5°.

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Weatherford EPS/Landmark Joint Venture

A demo of the Weatherford EPS²⁴ and Landmark joint venture showed how material balance and nodal analysis could be leveraged in Landmark's application software. Subsurface data captured in EPS' ReO is imported into Landmark's [Engineer's Desktop](#). A boxcar pressure signature was initially thought to be a bad valve. From Desktop Navigator²⁵ gaslift parameters were checked with [EPS WellFlo](#).

Also on show was the EPS controller for CIDRA intelligent completion (acquired in 2001) with optical sensing – distributed temperature, pressure, flow and seismic measurement. Weatherford has 'built a whole company built on production optimization'. Also acquired Premier Instruments last year with its Red Eye infra red water cut meter integrated with GLCC (cyclone separator) – an 'inexpensive accurate three phase meter'.



Weatherford's Red Eye 3 phase meter

Today, most data is recorded straight to the RTU. There is not much automated production optimization – most requires manual intervention. Production optimization estimated as a \$100 million business (to Weatherford?).

EPS' PanSystem well testing software was first released (for DOS) in 1993. Today, PanSystem is tied to Aspen Tech's HySys. EPS flagship is REO – Resource Optimizer from sand face to meters and plant. Pan Systems integrated with fiber DTS gauge to drive sliding sleeve on hydraulic flow control valve.

²³ Distributed Temperature Sensor – optical fiber-based measurement.

²⁴ EPS has two meanings in this context. Edinburgh Petroleum Services is a consulting and software house that was acquired by Weatherford earlier this year. Prior to this, Weatherford had brought its production management solutions together into a new unit – E-Petroleum Solutions. The confusion is rather convenient as Edinburgh is now a component of E-Petroleum.

²⁵ Desktop Navigator is a 'common working environment for drilling and production' providing a GUI front end to applications running on the EDM database.



Weatherford's Hydraulic flow control

To counter the 'no jewelry down hole' complaint, Weatherford's downhole devices are designed for robust, no electronics operations without electrical control or data feeds. All control is via hydraulics and data transfer over fiber. The Clarion downhole seismic measurement is clamped outside of production tubing and has no electronics. All done with lasers – with fiber used as piezo sensor.

WelleZ – VisuWell and WelleZ

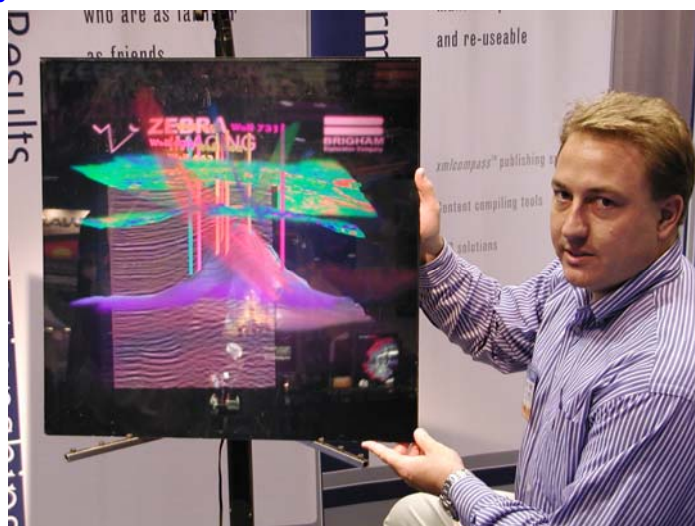
Internet-based (ASP) solution for creating high quality wellbore schematics and daily drilling reports. Used by Spinnaker Exploration.

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Zebra Imaging Digital Holography



Glasses-free 3D hologram – 1½ TB of data!

Zebra Imaging provides 'glasses-free' 3D for the boardroom or reception area. The digital holographic images contain 1½ TB of data. The 3D is compelling but hard to see how the technology could be used in other than a presentational environment. Zebra's current printing system is very slow with only 50 images produced per year. The company recently received \$12 million venture capital to develop speedier printing.

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Cash Prize - \$1,500 giveaway!



Scrimmage for \$1,500 cash giveaway.

At the end of the proceedings, the SPE itself drew the biggest crowd of the show – with a \$1,500 cash giveaway. No competition, just enter the draw and wait for your cash. We're not sure how this raises awareness of petroleum engineering, or advances any of the SPE's lofty aims. But it does qualify as the silliest thing we have seen at a tradeshow since the SEG unveiled its Doodlebugger statue.

This report has been produced as part of The Data Room's [Technology Watch Service](#). All material is © 2004 The Data Room unless otherwise stated. For more information about The Data Room's technology Watch Service please contact:

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