PROGRAM

MONDAY, APRIL 20

One 1-day pre-conference school will be presented Monday on Fundamentals of Sucker Rod Lift. Also on Monday, a two-day school will begin regarding CO2 Surface Facilities, Do's and Don'ts.

All the pre-conference schools are scheduled at the Lubbock Memorial Civic Center (1501 Mac Davis Ln), beginning at 8:00 a.m. and lasting until 5:00 p.m. Pre-registration is required for any of the pre-conference schools.

FUNDAMENTALS OF SUCKER ROD LIFT SCHOOL

"Fundamentals of Sucker Rod Lift" is a one-day seminar on the principles of sucker rod lift. Each component of the sucker rod lift system is discussed including the pumping unit, rods, tubing, pump, gas separator and prime mover. How the components function and interact with each other is presented so that the attendee can understand the entire operating system and how the components interact. An understanding of the reservoir and its producing potential and behavior must also be known to optimize the well's performance. Attendees will learn the principles of sucker rod lift systems and how to produce wells efficiently. The results of application of this information in the field will be an increase in production, a reduction in operating expense and greater profits.

Instructors for this one-day school are Jim McCoy and Lynn Rowlan - Echometer Company, Benny Williams – Harbison-Fischer, Tony Podio – University of Texas, Russell Stevens –Norris Rods, Jim Lea – PL Technology, LLC, and Andy Cordova – Lufkin Automation.

CO2 SURFACE FACILITIES, DO'S AND DON'TS (2-DAY SCHOOL)

"CO2 Surface Facilities, Do's and Don'ts" is a two-day workshop. Scope of the workshop is to cover practical operational practices in CO_2 flooding from facilities to specialized equipment in handling this recovery system from bottom hole injection to bottom hole production. Detailing and defining the team work and synergy required in operating a CO_2 flood by the facilities plant, mechanical, production, reservoir, and geophysical engineering involvement is discussed.

Operational controls, storage and transportation, and downhole injection and production control will be covered. The goals and practical resulting recovery of a CO_2 Flood must be carried out by the operating teams through a communication and reporting system focused on meeting the initial goals. Well remediation and maintenance requirements are also fundamental to a successful operation. Services capable of addressing corrosion, organic deposits, metering, stimulating, performing damage removal, solving and remediating well problems, specialized well tools, tubulars, isolation and zonal controls, and pumping systems are discussed.

This workshop is designed for Pumpers, Production Engineers, Reservoir Engineers, Field Foremen, Superintendents, Geologists and anyone wanting to better understand the operations of a CO_2 Flood Unit.

Instructors for this course will be Prentice Creel and John Gerke - Kinder Morgan CO2, LLP.; Rebecca Larkin, Bass Operating and Production Company; Mark Nicholas and Chris Bledsoe – Nicholas Consulting; Chance Dobson and Jason Bose – Baker Hughes Centrilift; and Sebastian Mancuso, Don Stegmann, Keith Bartrip and Ken Barker – Baker Petrolite.

TUESDAY, APRIL 21

On Tuesday, four pre-conference schools will be presented concurrently in separate rooms on 1) Sucker Rod Concepts, Design and Technology; 2) Dismantle, Inspection and Failure Analysis – A "Unified" Approach; 3) Corrosion and Chemicals in Production Operations, and 4) Back to Basic on Cementing, Stimulation and More. Also on Tuesday the CO2 Surface Facilities, Do's and Don'ts will be continued.

All the pre-conference schools are scheduled at the Lubbock Memorial Civic Center, beginning at 8:00 a.m. and lasting until 5:00 p.m. Pre-registration is required for any of the pre-conference schools.

SUCKER ROD CONCEPTS, DESIGN AND TECHNOLOGY SCHOOL

This workshop introduces sucker rod concepts and presents how dynamometer pump card analysis can be used to identify downhole operation problems. Understanding and troubleshooting the sucker rod pumping system can be aided through animation of surface and pump card loads and positions; animations will be used to show common sucker rod pumping problems. The sucker rod pumping system loads and polished rod position throughout a stroke can be predicted using the wave equation. The sucker rod string analyzed with data collected using a dynamometer system. The rod string can be thought as being infinitely long rod, where the rod string can be analyzed at any point along its length. Crooked holes and well bore deviation impact the design and analysis of the rod string. The effect of changing a parameter such as tubing anchor, stroke length, stroke rate, and pump diameter should be evaluated prior to making a change to a well. Gas interference, fluid pound and downhole compressive forces result in rod buckling and increased failures due to rod on tubing wear. New technology allows a planned or existing sucker rod system design to be evaluated and given a passing A, B, C, D, or failing F grade. This seminar will introduce various sucker rod concepts and help the participant understand how this technology can be used to improve the operation of sucker rod lifted wells.

Lynn Rowlan - Echometer Company; Jim Lea – PL Technology, LLC.; John Svinos – Theta Enterprises, and Jeff DaCunha - Spirit Energy will be presenting this course.

DISMANTLE, INSPECTION AND FAILURE ANALYSIS – A "UNIFIED" APPROACH

This course is being presented by John Patterson and Jeff Dwiggins of ConocoPhillips. The course will cover:

1. **Introduction** – Brief overview of course content and objective, which is to determine the "root cause of the failure".
2. **Post Failure Requirements** – Discussion of actions to be initiated upon a failure. This section outlines the importance of capturing data that may otherwise be lost. Very often, operators and manufacturers do not react quickly enough to quarantine valuable data that can lead directly to the root cause of failure.
3. **Pre-pull Requirements** – This section will outline what should occur prior to pulling the failed ESP. The discussion will stress the need for both the operator and manufacturer's service representative to be fully prepared to capture data while the ESP is being pulled.
4. **Pulling the ESP** - The section will outline key observations, actions required and data collection during the retrieval of the ESP from the wellbore. Valuable data is often lost due to the failure to recognize the importance of collecting data during a pull. This section will also highlight some significant improvements for observations and data gathering that are normally missed.
5. **Dismantle requirements and procedure** – Participants will be broken into separate groups to visit "component" areas. The purpose of this section will be to allow participants to gain "hands-on" evaluation of various components. The major areas will be: Motors, Seals/Protectors, Pumps/Gas Separators & Cable. Examples will be given with the participants being encouraged to actively participate in reviewing actual failed components.
6. **Break-Out Case Study -** If time permits, a break out case study will be given to the individual groups. The purpose of the case study will be to gain an understanding of the difficulty in conducting proper failure analysis as well as to emphasize the importance of collecting valuable data.
7. **Root cause determination** – Reinforce the importance of determining "root-cause" for any failure. Specific emphasis will be given to the "5-Whys" methodology.

CORROSION AND CHEMICALS IN PRODUCTION OPERATIONS

This school will cover the fundamentals of corrosion along with inhibiting and monitoring production wells. Additionally, production and operating problems caused by scale, paraffin, asphaltenes and bacteria will be presented. This includes formation, detection and prevention. The fundamentals of production coatings including types, applications and limitations and the use of surfactants/foamers for gas well deliquification will be covered. Technical experts from various industry companies will be teamed together

to cover these main topics. Norman W. Hein, Jr., P.E., Oil & Gas Optimization Specialists. LTD is the session coordinator and instructor.

BACK TO BASICS ON CEMENTING, STIMULATION AND MORE

This one-day seminar is designed to provide individuals, both new and experienced, in the oilfield with an overview of the basics of cementing, perforating, stimulation, tools and chemicals. Individuals experienced in each of these areas will give a one-hour overview on each of the above mentioned topics. These will not be in-depth, but simple discussions of the main elements. In addition, the discussions should provide guidelines to the questions needed to be asked that would help one work through an application.

Attendees will leave with an understanding of the basics of primary and remedial cementing, perforation choices and schemes, acidizing, hydraulic fracturing, choices and applications of service tools and variations in chemicals to enhance production and minimize wellbore and surface equipment problems. Covered will be some basic calculations, discussions of procedures, choosing the correct materials, limitations and more.

Instructors for this one-day course are Steve Metcalf, BJ Services; Prentice Creel, Kinder Morgan CO2; Bill Polk, Enertech; Jim Trela, Halliburton; John Todd with Nalco and representatives from Weatherford.

FEES FOR PRE-CONFERENCE SCHOOLS

The fee for the one-day schools: Fundamentals of Sucker Rod Lift; Sucker Rod Concepts, Design and Technology; Dismantle, Inspection and Failure Analysis – A "Unified" Approach; Corrosion and Chemical in Production Operations; and Back to Basics on Cementing, Stimulation and More is $350 for one day of pre-conference school or $550 if attending two days of pre-conference schools. The cost for the two day CO2 Surface Facilities, Do's and Don'ts school is $550. Pre-conference school registration includes lunch on day of school and registration to the SWPSC Conference, April 22-23. Enrollment for schools is by advance registration only, and space is limited. Advance registration will be accepted through April 10, 2009.

WEDNESDAY, APRIL 22

8:00 A.M. 2:00 P.M.	**REGISTRATION**	Exhibit Hall
8:00 A.M. – 5:00 P.M.	**EXHIBITS**	Exhibit Hall
8:30 A.M.	**MEETING OF AUTHORS**	Room 107
9:00 A.M. – 11:50 A.M.	MORNING TECHNICAL PRESENTATIONS See this brochure for titles, times and locations.	
12:00 P.M. – 1:15 P.M.	**INFORMAL BUFFET LUNCHEON** (Included with registration)	Exhibit Hall
1:00 P.M. – 3:00 P.M.	AFTERNOON PRESENTATIONS See this brochure for titles, times and locations.	
3:00 P.M. – 3:30 P.M.	**AFTERNOON BREAK-** Sponsored by the TTU Student Chapter of SPE **DOOR PRIZES** (Must be present to win!)	Exhibit Hall
3:30 P.M. – 4:30 P.M.	AFTERNOON PRESENTATIONS CONTINUED	
6:30 P.M. – 7:00 P.M.	**RECOGNITION BANQUET SOCIAL** (Cash Bar) Lubbock Club 1500 Broadway, top floor	
7:00 P.M.	**RECOGNITION BANQUET** (Tickets available at registration desk-included with registration) Recognition of Authors Recognition of General Chairman Recognition of Program Chairman Recognition of the Slonneger Award Recipient Recognition of the Duane A. Crawford Service Award	

THURSDAY, APRIL 23

8:00 A.M. – 12:00 P.M.	**REGISTRATION**	Exhibit Hall
8:00 A.M. – 2:00 P.M.	**EXHIBITS**	Exhibit Hall
9:00 A.M. – 11:50 A.M.	**MORNING TECHNICAL PRESENTATIONS** See this brochure for titles, times and locations.	
12:00 P.M. – 1:15 P.M.	INFORMAL BUFFET LUNCHEON (Included with registration) **DOOR PRIZES** (Must be present to win!)	
1:00 P.M. – 3:50 P.M.	AFTERNOON TECHNICAL PRESENTATIONS See this brochure for titles, times and locations.	

REGISTRATION FEES

Attendance for the one-day schools: Fundamentals of Sucker Rod Lift; Sucker Rod Concepts, Design and Technology; Dismantle, Inspection and Failure Analysis – A "Unified" Approach; Corrosion and Chemical in Production Operations; and Back to Basics on Cementing, Stimulation and More is $350 for one day of pre-conference school or $550 if attending two days of pre-conference schools. The cost for the two day CO2 Surface Facilities, Do's and Don'ts school is $550. Pre-conference school registration includes lunch on day of school and registration to the SWPSC Conference, April 22-23. Enrollment for schools is by advance registration only, and space is limited. Advance registration will be accepted through April 10, 2009.

Registration for the Southwestern Petroleum Short Course only (Wednesday and Thursday) is $ 185 when registering and paying in advance, or $190 at the conference. A one-day fee for either Wednesday or Thursday is $150 during pre-registration or $155 after April 10. (Fee includes lunch for Wednesday and/or Thursday, Proceedings, entrance into the exhibits, and the Recognition Banquet on Wednesday evening.)

PARKING

Free parking is available at the Lubbock Memorial Civic Center.

CLASSROOM SESSIONS

Technical papers will be presented in air-conditioned rooms. Classroom sessions are 50 minutes for presentation and discussion. Locations and times for the presentations are listed in the center section of this brochure.

EXHIBITS

Exhibits will open 8:00 A.M. on Wednesday, April 22, and Thursday, April 23, in the Exhibit Hall, one hour before presentations begin. This will give registrants a chance to visit with exhibitors and to have donuts and coffee. Registrants will be able to browse through the exhibits at their convenience any time during the day. The buffet luncheons on Wednesday and Thursday will also be held in the Exhibit Hall for greater exposure. Door prizes will be given away each day at the Conference. You must be present to win! Look for the drop box in the Exhibit Hall. A door prize ticket is included with registration.

HOTEL ACCOMODATIONS

The Holiday Inn Hotel and Towers, 801 Ave. Q, 806/763-1200: The hotel is offering a single rate of $80.00 per night, which includes one breakfast buffet per room per night. You must specify that you are with Southwestern Petroleum Short Course when making reservations in order to receive this rate. This rate is available for reservations made on or before April 3.

The Radisson Hotel, 505 Ave. Q, 806/747-0171: This recently renovated hotel is offering a single rate of $69.00. When making your reservations, you must identify yourself as a participant in the Southwestern Petroleum Short Course to receive this special rate. Reservations must be made by April 1, 2009.

PROFESSIONAL ENGINEERS CONTINUING EDUCATION UNIT CREDITS

All the SWPSC courses qualify for continuing education credits for those seeking CEU's for their Texas Professional Engineers License. Forms can be obtained at the registration desk.

(1) **BENEFITS OF SUSTAINABLE ELECTRICAL PROTECTION**

Ted Arbuckle and Zafiris Politis, Raycap Inc.

As today's artificial lift equipment becomes more sophisticated and provides greater rates of return it is more important than ever to strive for 100% reliability. Since the equipment is often deployed in harsh electrical environments it is important to take effective measures to protect this equipment from damaging electrical surges.

This paper will explore various methods that have been used to protect artificial lift equipment in the harsh electrical environments where they are often deployed. It will focus on practical applications, and solutions that are simple to install and have proven effective over multiple years of deployment. The paper will include a case study which demonstrates the economic benefits of using sustainable electrical protection systems to maintain production and protect artificial lift equipment from damaging electrical disturbances.

The material will be presented in a very straight forward manner and should be of interest to all.

(2) **SAFETY AROUND PUMPING UNITS**

Travis Bell, Lufkin Automation

Safety around Pumping Units is a basic overview of safety policies and procedures used by oilfield service companies to comply with federal regulations as well as requirements set forth by oil companies in order to achieve the overall goal of zero incidents and zero injuries.

(3) **TRAINING STANDARDS - BASIC ROD PUMP DESIGN AND THE EFFECTS OF TAGGING**

Larry Hambreck, Robert Hillger and Albert Garza
Pioneer Natural Resources
Charlie Burdette and Rodney Sands
Harbison-Fischer
Johnny Bunsen, Tommy White Supply

With the exponential growth that our industry has experienced, Pioneer Natural Resources needed additional training for their new hires concerning basic rod pump design and how the rod pump works in a **normal pumping system**. With PNR's vendor base, pumpers, technicians and management, we worked together to develop this training presentation.

Our discussions lead us to the issue of tagging wells and the effects it has on the entire pumping system. This team realized that this school would be beneficial to all field employees, not just new hires.

(4) WELL WEIGHING - A LOST ART?

Jeffrey J. DaCunha and Andy J. Fires, Spirit Global Energy Solutions, Inc.
Albert Garza and Rowland Ramos, Pioneer Natural Resources

There is no substitute for going out to a pumping unit and gathering data from a dynamometer, amp clamp, motor rpm, and fluid level in order to fully analyze a well and have as complete an understanding as possible. The physical act of stacking the well and attaching the horseshoe load cell along with the associated peripherals is becoming a lost art. In this study, we investigate the advantages in obtaining a thorough well analysis the old fashioned way and give examples of how a dynamometer and fluid level analysis outweigh any other type of study that can be performed on a well to obtain quantitative data on all the equipment, from the prime mover down to the pump.

(5) STATE-OF-THE-ART OF AUTOMATION FOR GAS WELL DELIQUIFICATION

Cleon Dunham, Oilfield Automation Consulting
Gregg Hurst, Weatherford Production Automation
James F. Lea, P.L. Tech
Greg Stephenson, Occidental Petroleum Co.

Automation of artificial lift systems is essential for effective management of deliquification for gas wells. There are at least fifteen forms of artificial lift in use for gas well deliquification. Often more than one method must be used in a given field because some methods are preferable earlier in a well's life and others are better later in a well's life.

Production Operators must have effective tools for gas well operation, surveillance, problem detection, control, and optimization. And, to be effective, there can't be a different tool for each form of artificial lift; there must be commonality of approach.

This paper reviews the current state-of-the-art in automation of gas wells, with a clear eye on the needs of the Production Operators for understandability, functionality, ease of use, and economics.

(6) THE USE OF INFRARED THERMOGRAPHY IN THE OIL AND GAS FIELD

Joe Flud, Pioneer Natural Resources
Sophia Panos, The Marshall-Teichert Group

Historically, gas recovery was not considered a profitable proposition for producers in the Permian Basin. Today's commodity gas pricing makes it a viable revenue generator with a 10:1 recovery payback. Safety and environmental incident prevention, lost profit potential, responsibility to shareholders, and the economics and feasibility of thermal imaging create a convincing case for investing in infrared thermography. Pioneer Natural Resources operates 5600 producing wells and 1617 tank storage batteries, with more than 2,000 miles of flow and transmission line in the Permian asset. In 2007 the company invested in a gas leak detection camera and a thermographer. The economics, safety and environmental benefits proved so compelling that a second camera and thermographer were added in 2008.

(7) THE ULTIMATE FILTRATION TOOL

Russell Franklin, Odessa Separators, Inc.

Sand problems can cost a company valuable time, money, and resources. Various methods have been used to reduce sand problems experienced in rod pump operations. This paper will present an alternative solution utilizing Pump Screens and Tubing Screens to handle the sand problem and increase production and profit capability. Illustrations will be examined which explain how the Pump and Tubing Screens function, and case studies will be reviewed that discuss the benefits and limitations of the screens.

(8) LEBRO PUMP SYSTEMS - FILLING THE GAP @ LOW SPM

Alex Rodriguez, BP
Katherine Gallagher, Pioneer Natural Resources

A growing majority of oil and gas fields in North America are mature or heavily depleted proposing many challenges for economic production. Low reservoir pressures, along with liquid loading, have become some of the main hurdles to overcome when attempting to economically produce natural gas. Deliquifying wells using artificial lift has become a prominent method used to tackle these issues. This paper discusses the challenges faced in the Oil and Gas industry with an eye to deliquifying mature or depleted reservoirs. It describes the pros and cons of the pump jack and the LeBro pump actuator currently being tested; it compares the cost of installing a pump jack vs. a LeBro pump actuator; and it also talks about testing done on horizontal Coal Bed Methane wells, and future design and implementation on deep well application (~12,500').

(9) LEVERAGING HYBRID WIRELESS SYSTEMS

Jim Gardner, FreeWave

Companies with large geographically dispersed networks, such as those in the oil and gas industry, can select one technology, one source, one vendor, to collect, retrieve, report data, and to assess the health of the network. Sometimes, this type of approach makes sense. However, other times integrating other types of technologies offer significant benefits that can easily and more cost-effectively be incorporated into one cohesive network.

In fact, the days of building large, unmanageable networks are behind us. Building large, elaborate radio networks is a way a company might demonstrate its vast expertise and deep knowledge base. However, there are options that allow us to consider better manageability, expandability, cost and speed.

(10) WIRELESS PLUNGER LIFT SYSTEMS

Jim Gardner, FreeWave

Automation electronics manufacturers have been focusing a great deal of their development efforts on the plunger lift control application during recent years. The objective has been to automate this process – through the use of electronics – and to also improve the time-based shut in procedures.

Why do this wirelessly? There are several compelling reasons, but the most compelling is expense. The other factors are:

- Faster installations, wireless can be running in 30 minutes verses several days with conventional wired methods.
- Less repair, a common source of irritation on well sites is the cut wire that was inadvertently severed when something was added later.

(11) EXTENDING TUBING LIFE WITH ENDURALLOY TUBING

Albert Garza and Larry Hambeck, Pioneer Natural Resources
Scott W. Long, Flexbar, Inc.
Johnny Bunsen, Tommy White Supply

In 2006, 18 subject wells were selected to increase the Mean Time between Tubing Leaks by strategically installing EndurAlloy Tubing.

From August 4, 2006 through August 31, 2008, failure performance was monitored for these 18 wells.

All 18 wells were initially installed with bare 2-3/8” tubing and 6 joints of 2-3/8” EndurAlloy on the bottom. As a result of 19 well service events (17 failures and 2 non-failures) in 10 wells, initial tubing designs were modified from the original design.

6 Wells	Bare 2-3/8", IPC and EndurAlloy Tubing	12 Well Service Events
3 Wells	Bare 2-3/8", EndurAlloy Tubing and IPC	3 Well Service Events
1 Well	Bare 2-3/8" and EndurAlloy Tubing	1 Well Service Event
8 Wells	Bare 2-3/8" and EndurAlloy Tubing	0 Well Service Events

This paper reports performance from continued monitoring of Tubing Leaks with all wells installed with EndurAlloy Tubing.

(12) OPTIMIZING PRODUCTION AND OVERALL EFFCIENCY WITH INTELLIGENT LONG STROKE HYDRAULIC PUMPING SYSTEM

Wallace Huard, DynaPump, Inc.

Many factors are involved when selecting the most cost effective artificial lift system. This paper will discuss the advantages of The DynaPump Intelligent Long Stroke Hydraulic Pumping System compared to other artificial lift systems.

This system has characteristics that allow for operation at much slower strokes per minute greatly reducing tubing and sucker rod wear while retaining the ability to produce at greater volumes from deeper depths than conventional beam pumping units. This system also has features that provide superior efficiency and flexibility at any rate and depth compared to other artificial lift methods.

This study compares electrical efficiency, well intervention costs, production optimization, adaptability to changing well conditions, ability to operate in harsh well conditions, and overall environmental impact between various artificial lift methods.

Included are actual operating parameters and runtime comparisons. The conclusions will aid in the selection of present and future artificial lift system requirements.

(13) HYBRID CASING PLUNGER REMOVES FLUID FROM GAS WELLS PRODUCING FROM MULTPLE PRODUCTION ZONES

Robert L. Moore, PAAL, LLC
Windel Mayfield, Lone Star Rubber

Recent innovations and repeated successful applications using the multiple patented PAL PLUNGER casing plungers suggested extending the applications to stripper gas wells that produce from multiple production zones and/or from wells with casing having obstructions that restrict

proper placement of down hole landing stops. The new HYBRID CASING PLUNGER, successfully installed and retrieved using a standard swab rig, removes well bore fluids from multiple production zones. The standard PAL PLUNGER was coupled with a unique down hole compression packer and fluid isolation assembly to permit well bore fluids to be lifted by gas flow to above the packer and subsequently removed from the well bore on the next plunger cycle. Bottom hole pressure data obtained shows the hydrostatic gradient to be that of the "dry" gas section of the well bore above the standing fluid level. Production data shows an increase in fluid removal and daily production rates.

(14) POLYMER GEL USED TO REDUCE PRODUCED WATER

Arturo Pena and Aaron Fuhr, ConocoPhillips
Dan Pender, Gel-Tec

The use of a polymer gel to reduce large volumes of water production in an aquifer-supported oil reservoir will be presented. Water invasion from the underlying aquifer had begun to water out the completion and repeated plug backs and cement squeeze attempts failed to block the water movement into the wellbore. A vertical permeability channel to the upper perforations in the near wellbore region was suspected to be the cause. A polymer gel treatment through the bottom perforations was selected to shut-off or divert the water. The gel (developed by Marathon Oil Co.) reduces the permeability thus creating a "blockage" in the formation channel. The job was successfully performed, and resulted in an 87% decrease in water production with no impact to oil production.

(15) PUMP INTAKE PRESSURE: COMPARISON OF VALUES COMPUTED FROM ACOUSTIC FLUID LEVEL, PUMP DYNAMOMETER AND VALVE CHECK MEASUREMENTS

A.L. Podio, University of Texas
James N. McCoy and O. Lynn Rowlan, Echometer Company

The three Pump Intake Pressure (PIP) calculation methods available for sucker rod lifted wells are discussed in detail. Values of PIP obtained from Acoustic Fluid level measurements, in wells with moderate pump submergence, yield PIP estimates that agree with those from pump fluid load analysis. If PIPs determined from these methods do not agree, then the operator using the discussed techniques can make corrections to consider the unusual conditions affecting the fluid load. Field data for a significant group of wells are used to compare the PIP results of the three methods. The results show that the PIP computed using the maximum and minimum pump card loads usually calculates too low of a PIP, while the PIP computed using the valve test loads are usually too high. Data processing techniques for improving the quality of the results from

dynamometer data are presented. The pros and cons of using each method are discussed.

(16) REFERENCE LOAD LINES AID IN ANALYSIS OF THE DOWNHOLE DYNAMOMETER PUMP CARD

O. Lynn Rowlan, James N. McCoy, Echometer Company
A.L. Podio, University of Texas

The pump card has three load reference lines 1) Zero Load line, 2) Fluid Load, Fo, from Fluid Level, calculated using the pump intake pressure determined from an acoustic Fluid Level measurement, and 3) Maximum Fluid Load, Fo max, line calculated by setting the pump intake pressure to Zero. Location of the wave equation calculated pump card loads with respect to three pump card reference loads can be used to recognize certain downhole problems. The position of a pump card relative to these load reference lines can be used to determine if there is 1) a shallow rod part, 2) a deep rod part or TV is stuck open, 3) Tubing is dry of well fluids, 4) the SV is stuck open or 5) the SV is stuck closed with no fluid is entering the pump. A normal pump card plots near the zero load line on the down stroke and plots near the Fo from Fluid Level load line on the upstroke.

(17) SAND PRO CONGER FMT PRESENTATION

Rodney Sands, Harbison-Fischer
Pete Castro, Chevron

After many years of producing a lower zone in the Conger FMT Chevron recompleted existing wells in an upper zone. The lower zone was closed off with a cast iron bridge plug. Severe problems with sand production were encountered and various methods were used to produce the well and deal with the sand.

This paper will review the problems and solutions encountered when these changes were made. It will also review the different pump designs that were used and which were successful.

(18) A COMPARISON OF THE PERFORMANCE OF LINEAR ACTUATOR VERSUS WALKING BEAM ROD PUMPING

Chris Schmidt and Ron Peterson, UNICO, Inc.

Rod pumping units historically used a crank driven walking beam to provide a reciprocating motion for oil and gas production. Several geometries have evolved over the years to produce desirable polished rod motion profiles and gearbox torque loads. These mechanical systems are limited in their ability to manipulate the motion profile and the profile is forever fixed by the selected geometry.

Hydraulic cylinder linear actuators became available a number of years ago for reciprocating rod pumping of oil and gas wells. Electrically driven rack and pinion linear actuators have also been recently developed for rod pumping applications. These hydraulic and electric linear pumping units share some common advantages over mechanical pumping units.

Linear pumping units are generally less massive than comparable walking beam units and can be mounted directly to the well head. The cost savings on site preparation, transportation logistics, and equipment installation can be substantial. Linear actuators also have an important advantage in their ability to provide programmable control of polished rod motion profile and closed loop control of polished rod load. The relatively low mass of linear actuator mechanisms allows nearly instantaneous adjustment of polished rod velocity and load.

Linear pumping units provide independent control of up stroke and down stroke peak velocities as well as the shape of the velocity profile. Controlling the velocity profile allows increased pump cycle rate and associated production without exceeding rod fall velocity limits. Velocity profile control can also be used to reduce gas interference and fluid pound. Rod stroke position can be controlled to provide period pump tapping to overcome down-hole pump problems. Polished rod load control can be used limit minimum rod load, eliminate bridle separation, and damp rod load oscillation.

(19) COMPREHENSIVE STUDIES ON THE FACTORS AFFECTING SUCKER-ROD COUPLING MAKE UP

Erik Tietz and Arun Sriraman, UPCO, Inc.

Beam pumping systems are operated in challenging and hostile environments due to the ever increasing demand to produce oil. Marketing research revealed the fact that 70% of failures in this industry were rod pin failures.

An in-house research & development project/experiment was conducted to address some of the critical factors governing rod pin failures. The experiment uses core engineering concepts of stress, strain, torque and circumferential displacement and explicitly answers the following questions.

a. How does the current displacement values affect rod-coupling make up and are they accurate?
b. What is the best type of lubrication technique (dry or wet face make up) for the application of rod-coupling make up and why?
c. What is the life of a sucker rod or what is the optimal number of make ups on a sucker rod?

(20) **A NEW APPROACH TO DESCRIBE THE GAS THROUGHPUT CAPACITY OF GAS LIFT VALVES**

Zoltan Turzo, University of Miskolc, Hungary
Gabor Takacs, The Petroleum Institute, Abu Dhabi

Gas passage performance of gas lift valves under dynamic conditions has only been studied in the last twenty years. Proper assessment of gas injection rates at valve operating conditions requires the use of sophisticated measuring and control equipment only a few companies possess; and involves tedious and time-consuming data acquisition procedures. As a result, many gas lift installations are designed even today without properly accounting for the dynamic behavior of operating gas lift valves.

The authors applied a novel approach to the description of gas lift valve performance and used Computational Fluid Dynamics (CFD) techniques to determine the valve's gas passage characteristics. CFD calculations provide a numerical solution of the governing equations (like the conservation of mass, energy, etc.) that can be written for a flowing fluid. To facilitate the simultaneous solution of the governing equations the flow space (the inside of the valve available for gas flow) must be divided into sufficiently small final volumes i.e. cells. Since the accuracy of flow modeling greatly depends on the proper setup of these cells the paper fully describes their proper spatial distribution.

After the cell structure of the gas lift valve was properly set up, CFD calculations allowed the calculation of the gas volume passed by the valve for different combinations of valve stem travels, injection, and production pressures; i.e. for static conditions. In dynamic conditions, however, valve stem travel is a function of the net opening force developing on the tip of the valve stem. Since this force can be found by integrating the pressure distribution on the valve stem tip, an iterative procedure was developed to describe the valve behavior. The final result of the proposed iterative calculation model is the dynamic performance curve of the gas lift valve i.e. the injected gas rate vs. injection, production, and dome charge pressures. The procedure developed by the authors gives gas injections rates very close to those received from the universally-applied RP 11V2 model.

(21) **FIVE YEARS OF PCP PRODUCITON WITH HOLLOW SUCKER RODS IN SOUTH ARGENTINA**

Francisco Diaz Telli, Daniel Muse and Fernando Godoy
Tenaris Sucker Rods

Conventional Sucker Rods were designed and thought for Beam Pumping applications as well as their make-up process (with

circumferential displacement). This brought many failures in the connection which is supposed to be stronger than the rod body.

A line of Hollow Sucker Rods (HSR) was developed with better material distribution and several advantages but basically providing more reliability due to the fact that they were thought from the development for PCP. They include a special connection with a SEC type of threads and torque shoulder which is made-up controlling torque with a regular pipe power tong.

This paper shows the experience in a field located in south Argentina were HSR have been working for more than 5 years in 17 wells. Field results and failures are discussed as well as special issues to have in mind when producing with this alternative.

(22) NEW HIGH LOADS SUCKER RODS FIELD EXPERIENCE

Francisco Diaz Telli, Daniel Muse, Ezequiel Fernandez and Matias Pereyra, Tenaris Sucker Rods
Rita Toscano, Simyteck

Sucker rods connection-related failures represent today one of the main limitations of beam pumping applications. More demanding field operative conditions are pushing connections to their limits, which become thus the weakest link of the system.

API Sucker Rods Specifications (11B) haven't changed much since the 70's. The fact that stress distribution is poor in current connection together with their tendency to get loose due to the lack of thread interference, are the main causes of stress concentration points which finally lead to failures.

After several attempts to come out with a solution to address this problem, a new premium connection was developed. Lab and field tests have shown it is capable of working way over the sucker rod body capacity.

Through this revolutionary change we've been able to expand the current beam pumping application limits. This paper will show field experience of sucker rods working under very high loads.

(23) PRESSURE ACTUATED CHAMBER TECHNOLOGY (PACT) A NEW ARTIFICIAL LIFT SYSTEM FOR CBM WELLS

Leslie Lam, Blackhills Exploration & Production
Ryan Davis, Merrion Oil & Gas
Mark Turland, ProActive Pumping Solutions, Inc.
Jim Wetzel, Nojak Pumping Solutions

New artificial lift technology, Pressure Actuated Chamber Technology, PACT, is proving to be a perfect choice for San Juan Basin producers searching for a more efficient and effective artificial lift method to produce CBM and other shallow, low volume gas wells. PACT has shown remarkable success in replacing both sucker rod pumping systems and swabbing as a gas well deliquification method.

The PACT system has no moving parts at the surface, a very small footprint, uses virtually no energy and doesn't require a pulling unit to install or service.

PACT systems operate by applying regulated and timed gas pressure to a series of downhole fluid chambers connected with 1.5" poly tubing in a closed loop system. Gas pressure is applied and exhausted to alternating fluid chambers and wellbore liquid is lifted, chamber by chamber, to the surface. The gas used to lift fluid is taken from the high pressure discharge side of the compressor. The gas that is exhausted from the system goes back into the low pressure suction side of the compressor.

This paper will explain how the PACT system operates and examine operational data on several wells before and after their conversion to the PACT system.

(24) ATTAINING SIGNIFICANT VALUE WITH SOLID EXPANDABLE TUBULAR TECHNOLOGY

Jasen Gast, Enventure Global Technology, L.L.C.

With over 1,000 installations, solid expandable tubulars have established a legacy as an enabling technology that mitigates a variety of unfavorable wellbore conditions without sacrificing hole size. In addition to the technical solutions, operators have realized significant savings by being able to conserve on pipe needs, consumable use, and environmental disturbance. Incorporating these systems into the initial wellbore plan reduced overall costs of some wells by up to 30%. Projects previously deemed cost prohibitive gained economic feasibility.

This paper describes the operational process of how solid expandable tubulars have been used in varied environments and conditions to solve a broad range of downhole problems. Actual case histories are used to illustrate how this technology was advantageous to projects, be it economic, technical, or environmental. This paper explains the planning and implementation process to ensure that maximum value of the solid expandable system is attained.

(25) **INCIDENT AT MORALES: AN ENGIENEERING ETHICS STORY**

Lloyd R. Heinze
Bob L. Herd Department of Petroleum Engineering- Texas Tech Univ.

Incident at Morales involves a variety of ethical issues faced by a company that wants to quickly build a plant in order to develop a new chemical product to gain a competitive edge over the competition. This 36 minute video developed and distributed by the National Institute for Engineering Ethics will be shown. Lloyd R. Heinze, will lead a short discussion following the video. This one hour session qualifies for Texas Professional Registration "Ethics" continuing education requirement.

(26) **CO2 COCKTAIL TECHNOLOGY**

Sayavur Bakhtiyarov, New Mexico Institute of Mining and Technology

A new promising CO2 cocktail enhanced oil recovery technology has developed. The technology involves in-situ generation of carbon dioxide to recover trapped residual oil from reservoirs. This technology has two at least unique features that set it apart from existing technologies. First, CO_2 is injected as part of a dense liquid phase (not simply compressed CO_2). Because the injected fluid is a dense liquid at ambient conditions, there is no need for the expensive compression costs that are associated with convention CO_2 injection processes. The gravity head associated with the fluid column allows CO_2 to be injected in a more cost-effective manner. This proprietary technology allows CO_2 to be released in-situ after injection into the reservoir. A second unique feature of this new technology is that a proprietary surfactant formulation forms foam when the CO_2 is generated in situ. The slim tube and core experimental results demonstrated advantages of the new technology. GTT, Inc. is leading commercialization of this technology in North America.

(27) **BULLHEAD TREATMENTS FOR WATER REDUCTION IN GAS WELLS**

Larry Eoff, Mauricio Gutierrez and Carlos Saravia
Halliburton Energy Services

Water production in gas wells can be a huge problem, in many cases causing premature well abandonment. Numerous techniques are used in attempts to allow continued production, including the use of foams and plunger systems. However, these techniques require continuous injection of chemicals and/or maintenance of equipment. Stopping, or slowing down, the water is another approach to the problem. This paper will discuss a bullhead polymer system which reduces the permeability to water much more than to gas. The system does not require zonal isolation

of the water producing zone, making for much simpler job design and execution than standard crosslinked gel treatments. The paper will discuss the polymer chemistry, laboratory test data, details on job design and execution, as well as case histories.

(28) CARBONATE OH ACIDIZING - TECHNIQUES THAT HAVE WORKED UTILIZING COILED TUBING

Jeffery G. Harris, BJ Services

This paper will address how coiled tubing, combined with advanced acidizing technologies, can improve the ability to optimize treatment coverage in openhole completions. Two methods that have been very successful in the Permian and Anadarko Basins are foam and self-diverting acid systems.

When acid is pumped into an openhole completion, it is difficult to determine precisely where the acid is going. It is vitally important to ensure that the entire interval is being treated adequately to optimize production. Coiled tubing and advanced acidizing technologies have shown tremendous promise with these stimulation techniques. This paper will also discuss the many techniques that have been attempted throughout the years with mixed results.

(29) ACETIC ACID SUCCESSFULLY STIMULATES SAN ANDRES

Steve Metcalf, BJ Services

Carbonate formations are predominate in the Permian Basin and as such are commonly stimulated with acids. Success of an acid treatment is dependent on knowledge of the reservoir, design techniques and execution; and emphasis on obtaining good zone coverage. In addition, effectiveness is very dependent on how many times a well has been acidized and with what kind of acid.

Case histories of acid stimulation, with production results, are presented on a new technique for stimulating the San Andres dolomite. Treatments were all low rate matrix treatments designed to minimize the increase in water production. Discussed are conditions to overcome in order to get effective acid penetration and thus stimulation. The case histories presented are on San Andres wells that have been acidized several times in the past, but where this new technique has provided an improved response over a longer period of time following the treatment.

(30) REMEDIATION OF PROPPANT AND FORMATION SAND FLOWBACK IN HIGH TEMPERATURE WELLS- A FIELD STUDY IN SOUTH TEXAS, USA

Marc Durkee, ConocoPhillips
Zeke T. Peak, Matthew B. Montes and Phillip D. Nguyen, Halliburton

Flowback of proppant and formation sand often become nuisance for operators as these solids cause equipment damage, costly cleanup treatments, and potential loss of production. These flowback problems are often compounded in severity in wells with high temperature and high pressure. Operators seek reliable solutions to (1) eliminate the need for frequent remedial cleanouts and surface equipment replacement, and (2) to maximize revenues by increasing and maintaining production rates.

This paper presents a field case-study that discusses the remedial treatments and lessons learned in more than 20 wells in south Texas that the operator has encountered with proppant and formation sand flowback problems. It also discusses the development and treatment processes using low viscosity consolidating agents to be applied in the treatments. Examples show how these problems were successfully overcome in these high temperature wells. Field cases histories are presented with detailed descriptions of the treatments, challenges, and recommendations during the course of the treatments.

Field results indicate that over 90% of these consolidation treatments have effectively stopped the flowback of proppant and formation sand while allowing the production rates of the wells to be increased. These treatments have drastically decreased the number of workovers as compared to the period before their treatments, or compared to the offset wells in the same field that consolidation treatments were not performed. This study has demonstrated that an effective coating of a curable resin on the proppant and formation sand close to the wellbore is necessary to help maximize the consolidation bonding between grains within the pack while minimizing any reduction of its permeability. Additives included in the liquid resin system permit good consolidation properties in the proppant pack, allowing it to effectively handle the shear forces of high production rates and the effect of stress cycling as the well undergoes producing and being shut in.

This new remedial treatment process greatly enhances the effectiveness of fluid placement into the propped fractures, regardless of the number of perforation intervals and their lengths, without mechanical isolation between the intervals. The simplicity of treatment helps make remediation economically feasible, especially in wells with marginal reserves.

(31) EFFECTIVE USED TUBING STRING PROFILE WELLCHEK DATA BASE WITH WEB ACCESS

Hilton Prejean and Brian Sutton, NOV Tuboscope

WellChek Database has been developed to provide a well specific, tubing string profile from an on-site used tubing inspection unit. Tubing is classified as it is pulled from the well, providing sequential information on a per joint basis within the string. Before being returned to production a detailed report of the tubing string is provided online, which can be viewed together with previous inspection results, containing critical information to the well management program. Routine well maintenance provides the opportunity for inspection data to be easily obtained. Field engineers find it beneficial to track wear and corrosion patterns, propensity, failure causes and success of mitigation techniques. Tubing issues make up a high proportion of production costs - rig time, lost production, tubular replacement and transportation. Working together with production engineering groups to analyze this data has yielded information to assist in making practical tubing management policies to reduce these costs.

(32) LIGHT WEIGHT CEMENTING WITH TUNED LIGHT

Robert Reyes, John Brown and Gerry Torres, Halliburton
Lito Perin and Jamie Lopez, Pioneer Natural Resources

As the gap between supply and demand continues to increase for oil and gas, operators are challenged to develop wells in various economic environments. Because of the cyclical nature of the commodity market and the constant change in commodity prices, operators reduce the overall cost while pursuing more and more challenging wells. One such environment is the “Wolfberry” play in West Texas. Because of the rapid early production decline in these wells they must be drilled and completed as efficiently and cost effectively as possible. This includes drilling to total depth quickly, running affordable casing and successfully achieving zonal isolation in a severely under-pressured environment. Single stage production cementing is a must to maintain the economic viability of these wells. In order to maintain long term stability of the well-bore, cement must be brought above the top of the Spraberry formation (7000’ to 7500’) from TD (9500’-10,500’) without fracturing the well. The Spraberry formation typically has a fracture gradient on the order of 0.43 – 0.53 psi/ft. If cement top is too low, remedial cement job(s) must be performed to isolate the productive zones from a potential up-hole corrosive water zone while still having adequate strength to allow us to fracture stimulate the Spraberry zone. Remedial cementing has a severe adverse effect on the economics of a well as well as compromising the well-bore because of the squeeze perfs.

Engineered solutions and application of new technology has addressed several of these issues and allowed drilling in areas of the basin that were previously thought to have marginal economics. We will look at several wells in this operator’s area of interest where cementing technology was used to achieve success in a challenging area. This included application of

a new low density cement achieve zonal isolation while still having enough strength to allow high pressure stimulation work to follow.

(33) CORROSION TREATING CONCERNS IN POST-FRAC WOLFBERRY COMPLETIONS

Richard Martin and Tony Smith
BJ Chemical Services

In the last several years, the WolfBerry play has received significant attention from both operators and service companies. While these multi-completion wells in the Wolfcamp formation (typically 3 zones) and Spraberry-Dean formations (typically 2-4 zones) have produced some very viable wells, they also have presented many operational challenges. One of these challenges has been reducing corrosion related failures during the early production stages of the well. After the well is put on pump, it is not unusual for the well to flow continuously, flow intermittently, or maintain high fluid levels. Any of these well conditions can adversely affect the application of corrosion inhibitors. The economic impact of corrosion related failures can be quite substantial due to the cost of pulling jobs, equipment replacement, and lost production due to downtime. This paper will examine the various causes of corrosion in the WolfBerry and review several corrosion treating options and case studies.

(34) AN OFTEN OVERLOOKED DETAIL IN WELL TREATMENT DESIGN

Stan Stephenson, Larry Mitschke and Joe Beisel
Halliburton Energy Services

When fracture stimulating a well, maximum wellhead pressure can be reached seconds after the high-pressure pumps are stopped following a rapid pressure increase during a “screenout” or other sudden flow stoppage. This maximum pressure is caused by a water-hammer effect. When this effect is ignored, maximum allowable wellhead and downhole pressures can be exceeded, even if pumping stops before reaching the maximum allowable pressure. This paper provides a method to calculate the water-hammer pressure. Data from several case study wells demonstrating the water hammer effect are compared to the calculated values obtained from the methods described in this paper. For tight formation screenouts, the predictions are within 12% of the maximum pressure recorded. Methods to help minimize the pressure surge are also presented. Use of these methods can minimize the risk to people, the environment, and equipment caused by the potential water-hammer pressure surge often overlooked in well treatment designs.

(35) EFFECT OF ACID TUNNELING STIMULATION IN OKLAHOMA LIMESTONE USING COILED TUBING

Lance Ruffel, Lance Ruffel O&G

Joseph Strasburg and Jeff Clark, BJ Services Co.

Options for improving productivity in older wells are re-stimulating the well or adding laterals extending past the original wellbore. A new technique achieves both in limestone formations. This technique creates pre-stimulated "tunnels" that bypass near-wellbore damage to make contact with newly exposed reservoir rock.

This technology relies on hydrochloric acid's ability to dissolve limestone along with a coiled tubing bottomhole assembly made to kick over toward the formation. A nozzle then jets acid at the formation creating tunnels extending from the wellbore. The technique works in all open-hole wells drilled in limestone and can be used to make multiple laterals in new or old wells.

This procedure was recently used in the United States for the first time. Three tunnels were created in an Oklahoma stripper well. This paper describes the tool and design including an operational timeline; lessons learned during the Oklahoma operation, pre- and post-job production information, and a cost/benefit analysis for the treatment.

(36) THE GEARED CENTRIFUGAL PUMP – A NEW HIGH VOLUME LIFT SYSTEM

John C. Patterson, ConocoPhillips Co.
William B. Morrow, Harrier Technologies, Inc
Michael R. Berry, Mike Berry Consulting LLC

The Geared Centrifugal Pump (GCP) is a high volume artificial lift system consisting of a progressive cavity pump style rotating rod string driving a bottom intake ESP style multi-stage centrifugal pump via a downhole speed increasing transmission. The heart of the system is the unique transmission that utilizes a novel gearing configuration that allows high torque and power. The GCP provides the high volume lift of an ESP but with better gas handling, simpler operation, and lower capital and operating costs. Additionally, since all downhole components are mechanical the GCP can operate effectively at very high temperatures.

ROOM AND PAPER NUMBER							
Time	Room 101	Room 104	Room 106	Room 107	Room 108	Room 110	Room 111
9:00- 9:50 A.M.		2	9	15	3	27	29
10:00 – 10:50 A.M.	24	13	1	8	6	28	32
11:00 – 11:50 A.M.	25	4	7	36	17		
12:00 – 1:15 P.M.	**LUNCH BREAK**						
1:00 – 1:50 P.M.	26	19	14	16	21	30	
2:00 – 2:50 P.M.		23	10	31	18	11	34
3:00 – 3:30 P.M.	BREAK (Sponsored by the TTU Student Section of SPE) Door Prizes will be drawn during the break – Must be present to win!						
3:30 – 4:20 P.M.		12	20	5	22	35	

WEDNESDAY, APRIL 22, 2009

ROOM AND PAPER NUMBER							
Time	Room 101	Room 104	Room 106	Room 107	Room 108	Room 110	Room 111
9:00- 9:50 A.M.		23	20	5	18	11	
10:00 – 10:50 A.M.	26	12	10	16	21	30	34
11:00 – 11:50 A.M.		19	14	31	22	35	
12:00 – 1:15 P.M.	**LUNCH BREAK**						
1:00 – 1:50 P.M.	24	4	1	36	6	28	32
2:00 – 2:50 P.M.	25	2	7	15	3	27	29
3:00 – 3:50 P.M.		13	9	8	17		

THURSDAY, APRIL 23, 2009

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√	Advance Registration	Fee	Total
	*April 20 (Monday) Fundamentals of Sucker Rod Lift	$350.00 ea. Includes Conference on April 22 and 23 (If attending Basics School on Monday **and** a School on Tuesday, the fee will be $550)	
	*April 21 (Tuesday) Sucker Rod Concepts, Design and Technology		
	*April 21(Tuesday) Dismantle, Inspection & Failure Analysis – A Unified Approach		
	*April 21 (Tuesday) Corrosion and Chemicals in Production Operations		
	*April 21 (Tuesday) Back to Basics on Cementing, Stimulation and More		
	*April 20 & 21 (Monday& Tuesday) CO2 Surface Facilities, Do's and Don'ts (2-day school)	$550.00	
	April 22-23 (Wed **&** Thurs) SWPSC Conference ($190.00 at Conference)	$185.00	
	April 22 **or** 23 SWPSC Conference One day only – specify Wednesday or Thursday ($155.00 at Conference)	$150.00	
	Extra Proceedings (one copy included with registration) ($70.00 after Conference)	$65.00	
	Proceeding Set on CD-ROM (1954-2007) must preorder & prepay	$250.00	
	CD-ROM Update (2009) must preorder & prepay	$65.00	
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ALL FEES ARE NONREFUNDABLE

*Enrollment for the Monday and Tuesday Schools is by advance registration only and is limited, so send in your advance registration fee early. School registrants receive complimentary (non-transferable) registration to the Conference on April 22-23, 2009.