



# 2012

# Automated Lift System (ALS)

Positive displacement, hydraulically driven, reciprocating, dual-acting Automated Lift System

#### Patents:

United States Patent Application: 20110030547 International Patent Application No.: PCT/CA2010/001211

## DITC – Energy Research & Development Co. Calgary, AB, Canada www.itechenergy.com

Automated Lift System (ALS) is a complete powered artificial lift system with significant innovation in all areas. ALS potential benefits include economic gains in terms of a single unit cost and maintenance/operation expenses making it competitive to the existing systems on the market. The system intelligent control unit enables immediate and advanced response to mitigate natural fluctuations in the well flow. Real time management from Control Center lowers risk of well control incidents and associated environmental hazards.



**ALS** application allows optimization of well production increasing amount of oil resource recovered and not left in the ground.

#### ALS consists of:

 the downhole component – a reciprocating, dual acting pump *Pump nExt* which represents a fundamental advancement in the design of positive displacement reciprocating pumps and meets the challenges and requirements of modern multiphase pumping.



 the surface power unit – Automatic Control/Power Module (ACM) powering and controlling operation of the ALS downhole component i.e. Pump nExt. In the automated mode, the ACM system uses its own internal algorithms to identify what is occurring in the wellbore and apply an automatic response. Each well equipped with ACM can be connected through a wireless setup to a remote Control Center, where well production and its status can be monitored and controlled remotely in real time.



#### **DESCRIPTION/APPLICATION:**

Oil wells may have initially natural flow to the surface i.e. enough pressure for oil to rise to the surface. However, as oil is produced bottom-hole pressure depletes over time in the wells and artificial lift is then required. There is also significant percentage of wells that require artificial lift from the very beginning. Pumping technologies were developed for producing oil well fluids and at the moment centrifugal and screw electric pumps (ESP and servomotor pumps) dominate the market. However, the existing technologies fail requirements posed by difficult oil reserves: sectional horizontal wells, heavy oils, high temperatures, low flow rates, small-diameter wells (exploratory, etc.).

The key challenge is to provide an efficient and reliable artificial lift system for wells with depleted bottom-hole pressure. The *Automated Lift System (ALS)* was developed by *DITC* to meet this demand.

ALS may be applied in both Oil and Gas producing wells.





In both the configurations the surface pump sends the clean power oil (or water/ condensate in gas well application) through the tubing string to the subsurface hydraulic pump installed at the bottom of the tubing string. The pump exhausts are then sent up a second parallel tubing string to the surface.

#### Downhole component of the ALS System – Pump nExt:

**Pump nExt** – an innovative, positive displacement, hydraulically driven, reciprocating, dual acting, **the nExt generation pump**, is installed on Coiled Tubing string at the well bottom. **Pump nExt** is driven by a unique motor/control section inherently incorporated in between pumping pistons. The solids handling and corrosion, the problems, which are significant barriers to achieving a low cost, reliable system have been recognized and addressed. **Pump nExt** has been designed specifically to provide reliability and flexibility in downhole pumping applications. **Pump nExt** is readily scalable in respect to O.D and stroke length and therefore in some applications it is the only solution of its kind currently available on the market. **Pump nExt** also answers the slurry pumping problems in all temperature range and at any landing position from horizontal through vertical.



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## ALS Surface Equipment:

**Automated Control/Power Module (ACM)** – the surface component of ALS is a part of the **ALS** closed loop circulating system. The primary mover i.e. electrically or diesel powered surface pump circulate power fluid to the downhole unit - **Pump nExt**. The flow of the power fluid from surface determines **Pump nExt** performance (e.g. pumping rate and lift).



**ACM** combines the surface pump with an intelligent pump controller. It is also equipped with a remote data transmitter allowing real time monitoring of the well over GSM network. It is important for well safety and process efficiency that **ALS** must identify and respond to changing conditions within the well. In the manual mode of **ALS** operations it involves reading data and interpreting it by an operator. **ACM** gives the operator capabilities to detect any abnormalities occurring in the well, to adjust the pumping process and/or remotely shut down the well production when required. In the automated mode, the **ALS** system uses its own internal algorithms to identify what is occurring in the wellbore and apply an automatic response.

**ACM** may integrate pressure transducers, flowmeters, automated choke systems and downhole isolation valves depending on the operator's field requirements. Precise pressure and flow rate information is acquired in real time and routed to the system intelligent control unit which enable immediate and advanced response to mitigate natural fluctuations in the well flow. In critical well events the potential complications are minimized by automatic safegards incorporated in *ALS* and/or by operator proactive response capabilities enhancing overall safety and well control.



The live video feature of ALS allows for remote visual inspection of wellsite in real time.

The Control Panel i.e. the Main Switch board of the ALS surface unit is duplicated in the ALS software.





Operator can remotely start/stop the pump, set the operation parameters,

monitor the pumping operation data through its submenus

On/Off	SYSTEM STRTU	P/F	
Set	PS: 157 BAR PP: 63 BAR PR: 6 BAR	FS: 8 L/MIN FP: 12 L/MIN FR: 4 L/MIN	Temp
ACM Time			Other

as well as manage servicing of the ALS power pack.

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· · · · · · · ·	On/Off Set	TOTAL WORK HOURS: ENGINE STARTS: WORKING SECONDS:	3 K 10 T 191 S	Р/F
• • •	ACM Time	TIME REMAIN. TO OUT		Other

**ALS** provides graphical records of the well production, where depending on operator requirements pressures, flow and temperatures can be plotted in real time.



### Pump nExt specifications:

	Pump nExt existing	Range of Sizes available as per Client	
	prototype	Specification	
		Minimum	Other sizes
Pump O.D.	3″	1.8″	2", 2 <sup>3</sup> / <sub>8</sub> ", 3" etc Custom
			designed for any specific
			Casing requirement.
Pump length	6 feet	4 feet	No limitation
Pump Piston O.D.	1"	<sup>3</sup> /4 <sup>''</sup>	No limitation
Stroke length	14"	2″	No limitation
Pump rate at 72 SPM	3 ½ GPM		

### ALS FEATURES:

- 1. DESIGN, PERFORMANCE AND RELIABILITY
  - a. Single/unified body, no couplings between pump, motor and control section
  - b. No limitation on a minimum pump flow rate. The change in the pump output is achieved by modulation of power fluid flow rate
  - c. Slurry and multiphase fluid pumping capability
  - d. Seals are lubricated by clean, filtered power fluid. Pump control section and motor are not exposed to abrasive well fluids
  - e. Designed for repeated stop/start operation
  - f. High temperature environment capable
  - g. Designed for operation in vertical as well as in highly deviated wells.

# 2. INSTALLATION and DEPLOYMENT

- a. The length of the *Pump nExt* is 50% shorter than other existing reciprocating pumps with the same stroke length.
- b. Easily deployed because of the short riser required for its installation.
- c. Easily transported, requiring no site assembly
- d. Pump nExt can be deployed by coiled tubing or hard tubing
- e. Depending on the application requirements *ALS* can be set up in open or closed systems

# 3. OTHER FEATURES:

- a. Can be powered by a fluid, water or gas
- b. No limit on pump setting depth
- c. Gas handling capability
- d. Chemical agents can be injected via power fluid

# 4. **SAFETY** and **Environmental benefits**

- a. Real time management from Control Center lowers risk of well control incidents and associated environmental hazards
- b. Automated Emergency Well Shut Down capability
- c. Closed loop circulating system reduces risk of spills
- d. Minimized foot print of the surface equipment

### For further information please refer to DITC website <u>www.itechenergy.com</u> or contact:

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