ZLPAM
Exceeding Your Expectations

ZL POLYMERS

EXCEEDING YOUR EXPECTATIONS

—

To Construct an Environmentally Friendly and Energy Efficient Society

ZL Group Companies

Henan Zhengjia Green Energy Co.,Ltd (China): +86 371 6256 9628
ZL Chemicals Ltd (USA): +1 800 878 1694
ZL EOR Chemicals Ltd (Canada): +1 800 878 1694
Polymer Experts LLC (Oman): +968 2413 6333
Email: info@zlpam.com
Website: www.zlpam.com

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PART.01

COMPANY PROFILE

ZL Group is a global leader in the water-soluble polymer manufacturing industry, leading in polyacrylamide (PAM) sales and technical services for the growing enhanced oil recovery and water treatment industries. ZL has produced a wide variety of polymers types, specifically for Oil and Gas industry. The foundation of products ZL offers are deeply rooted in technology and good corporate governance.

"We believe in treating our customers and employees with respect and fairness. Honesty, integrity and business ethics are considered in all aspects of our business. We believe that the key to our growth is through creativity and innovation."

Mission Statement

To provide our clients the desired products and services that will exceed their expectations.

"ZL group companies is nationally recognized, rooted with advanced technology that provides high-quality products and competitive pricing. Since 1995, we have focused our efforts on improving our products through R&D and have won numerous awards as a result. We have always been prudent with respect to our business expansion over the years. we are well established in the expanding enhanced oil recovery industry and have established a strong reputation in the industrial wastewater treatment market. Our vision is to become a global leader in PAM manufacturing, sales and technical service provider to both the oil and gas industry and wastewater treatment"

-ZL Group President SONG YIN LIU

Environmental Responsibility

ZL strives for balance between the need for energy and oil products and an environmental responsibility to leave as little impact as possible in its recovery. New manufacturing techniques, product technology, and field applications developed by ZL were in direct response to reducing freshwater injection in the oil re-covery process. In doing so, ZL encourages water reuse, improves oil recovery from existing oil wells, and significantly reduces the number of new wells required. This reduces ZL's environmental surface impact and costs associated with oil production.

ZL Team And Corporate Governance

The ZL team consists of over 300 employees and a network of consultants and joint ventures worldwide. ZL staff consists of highly experienced scientists and engineering professionals, including reservoir engineering, geology, chemistry and facilities experts.

PART.02

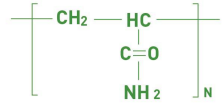
PRODUCTS AND SERVICES

Polyacrylamide is a water-soluble polymer used in a variety of ways such as water treatment, enhanced oil recovery (EOR), Friction reduction, cosmetics additive, absorbents, soil conditioners and many more. ZL's primary business focuses on highly specialized polymers used in EOR and Hydraulic fracturing.

Polymers used in EOR application (ZLPAM® Series) feature long-term stability and maintain a high degree of viscosity in challenging oil reservoir conditions.

Polymers used in Hydraulic fracturing applications (ZLFR® Series) require good friction reduction and viscosifying power under challenging salinity conditions.

ZL has spent considerable time in developing polymers to achieve these goals while maintaining its cost competitiveness in a global marketplace.



Polyacrylamide (PAM) is a long chain water soluble polymer made up of individual monomer units. It has many uses including water treatment clarification, viscosity modification, friction reduction, sludge dewatering and adsorption. It is often referred to as "polymer" or "flocculant".

Polyacrylamide

ZL offers a wide range of polyacrylamide products in the following categories:

	Anionic	Cationic	Non-anionic	Zwitterion
Anion %	5-45%	0	0-3%	0-5%
Cation %	0	5-70%	0	0-5%
Molecular weight (Million Dalton)	2-35	2-15	2-15	2-10

Services

ZL designs, develops and provides chemically enhanced oil recovery (CEOR) technologies that increase the field development effectiveness and improve oil recovery. ZL Chemical technologies has been successfully applied in some of the most challenging reservoir conditions across the globe. For instance, polymer flooding applications resulted in an additional production of 50-120 tons of oil per ton of polymer applied.

ZL's polymer solutions can be tailored to specific reservoir conditions. The facilities engineering design is field and location specific.

ZL provides variety of technical support for selecting the right stimulation chemicals for our customers, not limited to optimized FR and HVFR. It's technical support team consists of over 20 personnels provides not on Chemical evaluation but also on site trouble shooting services.

ZL has dedicated significant resources to its R&D and technical support, it's team members possess strong knowledge and experiences in chemical development and applications.

PART.03

SERVICES

ZL has over 70 units of analytical testing equipment: AXP work station, SUN work station, Micro EOR laboratory, RS-75 rheometer, the long core test facility, Hitachi Z-5000 atomic absorption spectroscopy equipment, Brookfield viscometer, loopline for offshore polymer testing operations. ZL possess specialized software required for experimentation, chemistry, field static and dynamic modeling, facilities control.

Services

With over 30 staff members working in the R&D department, ZL allocates 4% of its annual sales to the development of new products, as well as the improvement of current products and facilities.

ZL's R&D center collaborated with the Chinese Academy of Sciences, successfully developing and commercializing several leading technologies, including Nano-spheres and offshore polymer flooding technologies.

ZL's R&D department supports the followings research activities:

Products selection / applications

01 ZL works with their customers to select the most suitable products to obtain the maximum investment return:

Polymer evaluation and selection criteria for EOR application		
Molecular Weight	Apparent Viscosity	Hydrolysis Degree
Core Flooding Test	Filtration and Screen Factor Test	Dissolution Time
Long Term Stability	Injectivity Test	Adsorption Test
Viscoelasticity	Shear Thinning	Mechanical Shear Degradation

02 Develop cost effective, customer specific solutions:

Project Evaluation	Reservoir Viability
Pilot Test	Optimize Polymer Selection
Full Field Implementation	Experimental Program

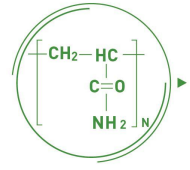
03 Polymer evaluation and selection for hydraulic fracturing application:

Flow Loop-Friction Reduction Rate Test	
Rheology Test	Viscosity Test
	Viscoelastisity Test
	Shear Thinning Test
	HPHT
	Hydration Test
	Break Test
Chemical Compatibility Test	

PART.04

POLYACRYLAMIDE APPLICATIONS

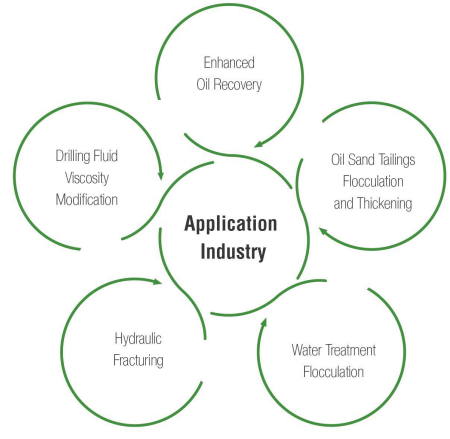
Polyacrylamide (PAM) is a long-chain water-soluble polymer made up of individual monomer units. It has many uses, including water treatment clarification, viscosity modification, sludge dewatering and adsorption. It is often referred to as "Polymer" or "Flocculant".



When aqueous PAM solutions are mixed with sewage, the active amide groups on the polymer chain adsorb onto the surface of suspended material in the sewage and create a bridge between them to exclude water from their newly formed structure. ZL is dedicated s to preventing precipitation and coiling behavior, enhancing its salinity and temperature resistance ability, and maintaining the linear structure of the polymer chains.

Application Industry

Polyacrylamides are widely used in enhanced oil recovery, hydraulic fracturing, drilling, produced waste water treatment, oil sands tailings dewatering and mining industries, etc.



ZLPAM Applications

01 Enhanced Oil Recovery

Introducing viscous polymer solutions to the flooding process, the efficiency of the volumetric sweep increases, reducing water channeling and breakthrough. These effects result in improved oil recovery.

ZL's innovative polymer technologies offer our customer the very effective and economically attractive development option for their fields. Please refer to EOR section for more information on ZLPAM® product lines for EOR appliczion.

02 Hydraulic Fracturing

Polymers can effectively reduce fluid friction in a pipe. The friction loss can be minimized by 50-80% with small amounts of PAM added to the liquid phase.

ZL friction reducers are designed to be used in waters with different properties. ZLFR® will quickly reduce the friction by as much as 70% or more. ZLFR® include both dry-power and liquid polymers with fast dissolving ability, targeted at high-salinity and hightemperature environments. ZLFR® series of products not only offering reducing friction but also used as viscosifying agent.

Please refer to FR section for more information on ZLFR® product lines for Hydraulic fracture application.

03 Drilling Fluid: Viscosity Modification

Polymers are used as extenders. Increase in the drilling fluid viscosity provides improvement in the removal of cuttings and better control of fluid densities and lubrication of the drilling bit. In addition, during downtime, the cuttings will be held in suspension, thus not causing any problems with solids settlement.

ZL polymers for drilling fluids offer higher viscosity buildup meaning less dosage, and better stability in high salinity and high-temperature environments.

04 Water Treatment: Flocculation

Polymers can bridge together the particles suspended in solution by an adsorption process. Polymers often have electrostatic charges that gives surface particle neutralization resulting in flocculation.

ZLFLOC® product lines offer a wide variety of products for water treatment applications, including anionic, cationic, Non-ionic, and Zwitterion. ZL works with their customers to select the most suitable product for achieing their objectives and minimize their cost of water treatment.

05 Oil Sand Tailings: Flocculation and Thickening

Polymers are used to thicken a variety of sludge in both neutral and acidic conditions. PAM used for thickening may have special structures such as branched and cross-linked.

ZL polymers for oil sand tailings offer fast and effective flocculation with better turbidity, ZL works with their customers to select the suitable polymers, providing consultancy and laboratory tests.

PART.05

ZL EQUIPMENTS

ZL Equipment division offers the most advanced Venturi polymer dispersion system. ZL is focused on reducing the mechanical aspects of all their equipment, and increasing its efficiency to minimize CAPEX and OPEX. More information is available in equipment section.