



HYBRID PROTECTION MACHINE FOR TUBING AND  
EQUIPMENT IN THE PETROLEUM INDUSTRY  
BASED ON NANO TECHNOLOGY

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# NHM TB1

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# INTRODUCTION

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The petroleum industry faces significant challenges in maintaining production efficiency due to paraffin deposition and corrosion in oil drilling pipes and equipment. These issues lead to increased production costs, frequent pipe replacements, and extended well closures for maintenance.

To address these challenges, a revolutionary hybrid protection machine has been developed, utilizing advanced nanotechnology to apply specialized coatings to tubing and equipment.

This innovative solution reduces paraffin deposition and corrosion, minimizes maintenance requirements, and enhances operational efficiency.





The hybrid protection machine represents a transformative solution for the petroleum industry, addressing critical challenges of paraffin deposition and corrosion. By leveraging advanced nanotechnology, this innovative system reduces production costs, minimizes maintenance requirements, and enhances operational efficiency.

With its potential for commercialization, the hybrid machine is poised to revolutionize tubing protection in oil and gas operations worldwide.





# PARAFFIN DEPOSITION PROBLEMS

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Paraffin deposition is a widespread issue during crude oil production and transportation. It occurs when paraffin waxes separate from crude oil and adhere to the inner walls of tubing, obstructing flow and reducing efficiency.



Common methods to combat paraffin deposition like mechanical cleaning (slick line tools and pigging methods) electric heating, ultrasonic and microbiological treatments (for breaking down paraffin deposits) , paraffin Inhibitors (chemical solutions to prevent wax formation) - remains with limited efficiency.

Recent advancements in nanotechnology have shown great promise in addressing paraffin deposition. Nano-coatings, applied to the inner walls of tubing, create super-hydrophobic and oleophobic surfaces that repel fluids and prevent paraffin adhesion. These coatings also offer long-lasting protection, reducing the need for frequent cleaning and maintenance.



# CORROSION CHALLENGES

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Steel tubes in oil and gas wells are exposed to high temperatures, pressures, and corrosive environments, leading to material degradation. Corrosion weakens the mechanical properties of steel and welded joints, increasing the risk of tube failure. Such failures not only compromise operational safety but also pose environmental risks, affecting soil, water, and air quality.

Nano-coatings provide a promising solution to combat corrosion. By forming a protective barrier on the inner walls of tubing, these coatings inhibit corrosion, extend the lifespan of equipment, and reduce the frequency of maintenance. The coatings are resistant to UV rays, chemicals, salts, and minor mechanical damage, ensuring reliable protection in harsh conditions.



# NANO TECHNOLOGY

## PRINCIPLE OF OPERATION

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Industrial nano-coatings are designed to address paraffin deposition and corrosion problems effectively. These coatings are characterized by:

- **HIGH STRENGTH** - Durable and resistant to extreme temperatures (-50°C to +1600°C)
- **NANOPARTICLE SIZE** - 2nm particles create a smooth, protective surface.
- **CERAMIC PROTECTION** - SiO<sub>2</sub> with 99% purity forms a robust barrier.
- **HYDROPHOBIC AND OLEOPHOBIC PROPERTIES** - Repels fluids and prevents adhesion.
- **SELF HEALING** - Fills small damages and blocks existing corrosion.



Nano-coatings bind to metal surfaces, creating a network structure that repels fluids and prevents paraffin and corrosion. This technology significantly reduces maintenance requirements, extends equipment lifespan, and improves operational efficiency.

The application of nanotechnology-based coatings offers numerous benefits for the petroleum industry:

- ✓ **Reduced Maintenance:** Decreases the frequency of mechanical wellbore cleaning by 30-50%.
- ✓ **Improved Efficiency:** Enhances operational performance and reduces downtime.
- ✓ **Long-Term Protection:** Provides stable and durable protection against paraffin and corrosion

Nanotechnology protects crude oil pipelines by using nanoparticles and nanocoatings to create dense, self healing and anti fouling barriers that enhance durability and extend pipeline service life under harsh operating conditions





# HYBRID MULTI PURPOSE DRIVE MACHINE **NHM TBI**

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The NHM TBI hybrid machine is a groundbreaking system that addresses the challenges of paraffin deposition and corrosion in oil drilling pipes. Its unique features include:

**Simultaneous Cleaning and Coating:** Removes deposits and applies nano-coatings in one process.

**Thermal Stabilization:** Ensures long-lasting protection.

**Endoscopic Camera Control:** Monitors the coating process for quality assurance.

**Additional Options:** Sandblasting and painting the inner surfaces of pipes.

The hybrid machine is a comprehensive solution for applying nano-coatings to the interior walls of oil drilling pipes and equipment, designed to clean, polish, and apply protective coatings.



The NHM TBI hybrid machine is an innovative and versatile system designed specifically for the oil drilling industry to combat common issues such as paraffin buildup and corrosion within drilling pipes.

Advanced features and multifunctional capabilities make it a comprehensive solution for maintaining the integrity and performance of drilling pipes.

The NHM TBI hybrid machine offers a state-of-the-art solution for oilfield operators seeking to enhance pipeline longevity and operational reliability. Its advanced technology ensures thorough cleaning, protective nano-coating application, and optional surface treatments, all integrated into a single, efficient system.







### **SIMULTANEOUS CLEANING AND COATING**

The NHM TB1 can clean the interior surfaces of pipes by removing paraffin deposits, scale, and other impurities.

During the same process, it applies nano-coatings to the cleaned surfaces, creating a protective layer that enhances resistance to corrosion and paraffin buildup.

This dual-function process saves time and reduces operational costs by combining cleaning and coating into a single operation.

Range of tubing sizes: The machine is capable of processing pipes with diameters from 60mm to 300mm, making it suitable for a wide range of equipment.



## BENEFITS

### ➤ EFFICIENCY

Combines multiple maintenance steps into one process, reducing downtime.

### ➤ DURABILITY

Extends the service life of pipes by preventing corrosion and fouling.

### ➤ COST - EFFECTIVE

Reduces labor and material costs associated with traditional cleaning and coating methods.

## THERMAL STABILIZATION

The machine employs thermal stabilization techniques to ensure that the nano-coatings and cleaned surfaces maintain their protective properties over a long period. This feature helps in preventing the re-accumulation of paraffin or corrosion-related damage, thus prolonging the lifespan of the pipes





# REMOTE CONTROL AND MONITORING

The integration of remote control and monitoring capabilities opens new possibilities for enhancing operational efficiency, reducing downtime, and enabling global oversight of oil drilling and production processes.

By leveraging advanced communication technologies, the machine can be operated, monitored, and maintained from virtually anywhere in the world. This capability is particularly valuable for the petroleum industry, where operations are often conducted in remote and challenging environments.

## CONTROL INTERFACE

Operators can access the machine's control system through a web-based or mobile application. The interface provides real-time visualization of machine operations, including live video feeds from the endoscopic camera.

Remote commands can be issued to start, stop, or adjust the machine's functions, ensuring precise control over the coating and cleaning processes

## GLOBAL CONNECTIVITY

The system supports multiple communication protocols, including 4G/5G, Wi-Fi, and satellite links, ensuring reliable connectivity even in remote oil fields

A Virtual Private Network (VPN) ensures secure data transmission, protecting sensitive operational information.

The remote control system allows operators and engineers to manage the machine from any location, facilitating centralized management of multiple machines across different sites.





# Key Features of Remote Control and Monitoring

## REAL-TIME PERFORMANCE TRACKING

Operators can monitor the machine's performance metrics in real time, ensuring optimal operation and immediate response to any deviations.

## DIAGNOSTICS AND PREDICTIVE MAINTENANCE

The system enables remote diagnostics, allowing technicians to identify and troubleshoot issues without the need for on-site visits by analyzing historical and real-time data.

## MULTI-SITE OPERATIONS

For companies managing multiple oil wells, centralized remote control enables efficient coordination and oversight of all machines from a single location.

## CLOUD-BASED DATA PROCESSING

Data collected by the IoT sensors is transmitted to a secure cloud platform and processes and analyzes the data, providing actionable insights and enabling predictive maintenance.





# 24/7 SERVICE AND SUPPORT

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To ensure uninterrupted operations and maximize the efficiency of the hybrid protection machine, a comprehensive 24/7 service and support system is essential.

This service framework is designed to provide round-the-clock technical assistance, rapid issue resolution, and proactive maintenance, ensuring the machine operates at peak performance at all times. Such support is critical for the petroleum industry, where downtime can lead to significant financial losses and operational disruptions.

## 24/7 TECHNICAL ASSISTANCE

A dedicated team of experts is available 24 hours a day, 7 days a week, to provide immediate support for any technical issues. Support channels include phone, email, live chat, and video conferencing, ensuring quick and efficient communication.

## REMOTE TROUBLESHOOTING

Real-time data from IoT sensors and endoscopic cameras allows for precise identification of problems and immediate corrective actions.

Leveraging the machine's remote monitoring capabilities, technicians can diagnose and resolve issues without requiring on-site visits.





# 24/7

The 24/7 service and support system is a critical component of the hybrid protection machine's operational framework. By providing round-the-clock assistance, proactive maintenance, and rapid issue resolution, this service ensures the machine operates reliably and efficiently, even in the most demanding conditions.

With its focus on minimizing downtime, enhancing safety, and reducing costs, the 24/7 support system is an indispensable asset for the petroleum industry, enabling seamless operations and peace of mind for operators worldwide.







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