

CAREERS THROUGH MATHS: OIL RIG TECHNICIAN



JOB DESCRIPTION

As an Oil Rig Technician—often referred to as a Production Technician or Multi-Skilled Technician in the North Sea sector—you are the backbone of offshore operations, ensuring that complex extraction machinery runs safely and efficiently. Your day typically begins with a 5:30 AM handover meeting where you review the previous 12 hours of production data and plan maintenance schedules. Working on platforms such as those operated by BP, Shell, or TAQA in the UK Continental Shelf (UKCS), you are responsible for the installation, inspection, troubleshooting, and repair of mechanical, electrical, and instrument systems. This is not a desk job; you are on your feet for 12-hour shifts, often in harsh weather conditions, wearing full personal protective equipment (PPE) while working at heights or in confined spaces. A typical fortnight on, fortnight off rotation (often referred to as a '2:2' swing) means you will live on the platform for two weeks, working 84-hour weeks, followed by two weeks of leave.

Your core duties are incredibly varied. On a single shift, you might perform a routine vibration analysis on a gas compressor, calibrate a pressure transmitter using a HART communicator, or assist in a 'permit to work' (PTW) procedure for a high-risk maintenance task. Mathematics is woven into every single one of these activities. When you calculate the torque required for a flange bolt, you are applying physics and arithmetic. When you read a P&ID (Piping and Instrumentation Diagram) and calculate the flow rate through a choke valve, you are using fluid dynamics principles. You must accurately log all your work using a Computerised Maintenance

Management System (CMMS) like SAP or Maximo, where you input precise data on equipment performance and failure rates. Perhaps the most critical mathematical task is the calculation of 'dead-legs' and 'void volumes' during well interventions, ensuring that the correct volume of kill fluid is pumped to safely control well pressure. The role demands a cool head, a high level of numeracy, and the ability to make rapid, accurate calculations that directly impact the safety of the crew and the integrity of the platform.

The working environment is unique: you are miles from shore in the North Sea, with helicopters (often from Aberdeen or Sumburgh) as your only commute. The role operates within the strict regulatory framework of the Health and Safety Executive (HSE) and the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED). You must be adept at completing detailed risk assessments and method statements (RAMS), which require a logical and mathematical approach to quantifying risk. For example, you might use a risk matrix to score the likelihood and severity of a potential hydrocarbon leak. In an emergency, you have a designated role on the fire team or in the survival craft, where you must quickly calculate the capacity of lifeboats versus the number of personnel on board. This is a high-stakes, highly technical career where precision, reliability, and mathematical confidence are non-negotiable.

HOW MATHEMATICS IS USED

- **Fluid Mechanics and Hydraulics:** This is the core maths of the oil industry. You use Bernoulli's equation to calculate the pressure drop across a section of pipe or a control valve. For example, if a pump is delivering 2000 barrels of crude oil per hour through a 6-inch pipeline, you must calculate the velocity and the resulting friction loss to ensure the pump is not cavitating. You also calculate 'hydrostatic pressure' using the formula $P = \rho gh$ (density $\times$ gravity $\times$ height). If you are working on a wellhead with a vertical height of 20 metres above the reservoir, you can calculate the pressure exerted by the mud column to ensure it overcomes the reservoir pressure, preventing a blowout.

- **Algebra and Formula Manipulation:** Technicians frequently rearrange complex formulas to find unknown variables. For instance, using the Gas Law ($PV = nRT$) to calculate the volume of gas released in a tank blowdown scenario. Or, you might use the Affinity Laws for centrifugal pumps: if you change the impeller diameter from 200mm to 180mm, you can use the algebraic relationship ($Q1/Q2 = D1/D2$) to calculate the new flow rate without having to physically test the pump, saving hours of downtime on a platform like the Brent Charlie.

- **Trigonometry and Geometry:** When lifting heavy loads with a crane, you use trigonometry to calculate the sling angle and the resulting tension in each leg of the sling. If the load is 5 tonnes and the sling angle is 60 degrees, you use sine and cosine rules to determine the force on each sling. You also use geometry to calculate the volume of tanks and vessels. If a separator vessel is a horizontal cylinder with hemispherical ends, you must integrate basic geometry to calculate the volume of liquid present based on the level reading from a sight glass, a calculation crucial for preventing liquid carryover into the gas system.
- **Statistical Process Control (SPC) and Data Analysis:** Modern platforms are equipped with thousands of sensors. A technician must analyse trends in data to predict failures. You will use statistical methods to calculate the mean, median, and standard deviation of vibration readings on a rotating shaft. If the vibration amplitude exceeds the mean plus three standard deviations (a common SPC rule), it triggers a 'high alarm', indicating an impending bearing failure. This predictive maintenance approach, often using software like OSIsoft PI, relies heavily on understanding distributions and probability to avoid unplanned shutdowns.
- **Electrical Theory and Ohm's Law:** For the electrical side of the role, you constantly use Ohm's Law ($V=IR$) and Kirchhoff's Laws to calculate current, voltage, and resistance in control circuits. If a variable speed drive (VSD) is controlling an electric submersible pump (ESP), you must calculate the power requirement ($P = \sqrt{3} \times V \times I \times \text{Power Factor}$) to ensure the generator on the platform is not overloaded. You also calculate the 'cable volt drop' over long distances to ensure that the voltage at the motor terminal is within acceptable limits.

KEY SKILLS & TOOLS

Skill/Tool	Application
Handheld Communicators (HART)	These are used to configure and diagnose smart instruments. You use them to perform 'range setting' (calculating the 4-20mA output scaling) and to perform 'characterisation' of a differential pressure transmitter, requiring calculation of square root functions for flow measurement.
CMMS Software (SAP PM / Maximo)	This is the central hub for all maintenance data. You input work order details, log hours, and record spare parts usage. You use the software to generate 'lookahead' schedules, calculating the work

	backlog and estimating the man-hours required for the upcoming week.
Data Historian (OSIsoft PI)	This software collects real-time data from the plant. You use it to create 'XY plots' and trend charts to compare variables like suction pressure vs. discharge pressure on a gas compressor, using the data to calculate isentropic efficiency and diagnose performance degradation.
Microsoft Excel	Excel is a vital tool for creating bespoke calculation spreadsheets. You might build a spreadsheet to calculate the required torque for a flange based on bolt size and gasket material, or create a dynamic 'bowtie' risk assessment model that calculates the probability of a leak event.
Multimeter and Megger	These are essential for electrical fault-finding. You use a multimeter to measure resistance and calculate expected current draw. A Megger is used to test insulation resistance (IR); you apply a high DC voltage and measure the resistance in megohms, using the results to calculate the Polarisation Index (PI) which tells you if a motor winding is wet or contaminated.
Laser Alignment Tools	Shaft alignment is critical for pump longevity. Using a laser alignment tool (like an SKF system), you input the dimensions of the coupling and the tool calculates the required shim adjustments (in millimetres or thou) to be added or removed from the machine's feet to achieve perfect alignment.
SAP Safety & Risk Modules	You use these for Permit to Work (PTW) systems. You must calculate the safe isolation distances for hot work, assess gas test results (LEL/UEL percentages), and ensure that the gas reading is below 10% of the Lower Explosive Limit (LEL) before issuing a permit.

Typical Pathway: The most common UK route begins with achieving strong GCSEs (grades 9-4) in Mathematics, English, and the Sciences. Following this, you would typically pursue an Advanced Apprenticeship in Engineering (Level 3) with a company like Petrofac, or attend a Further Education college to study for a BTEC Level 3 in Mechanical or Electrical Engineering. Many aspiring technicians join the industry via the OPITO-approved 'Step Change in Safety' initiative, which provides a standardised route. After 2-4 years of apprenticeship, you will gain the essential OPITO BOSIET (Basic Offshore Safety Induction and Emergency Training) and MIST

(Minimum Industry Safety Training) certificates, which are mandatory to travel offshore. Career progression often moves from Technician to Senior Technician, then to a Maintenance Supervisor, and eventually to an Offshore Installation Manager (OIM). Many technicians also choose to top up their qualifications to a Higher National Certificate (HNC) or Foundation Degree in Engineering via distance learning with institutions like Robert Gordon University in Aberdeen, which can lead to chartered status with the Engineering Council (IEng or CEng).

Industry Demand: The UK oil and gas sector, heavily concentrated in Aberdeen ('Europe's Oil Capital') and the wider North East of Scotland, continues to require a steady stream of technicians to replace an ageing workforce and support the energy transition. According to reports from Offshore Energies UK (OEUK), there is a pressing need for over 40,000 new recruits by 2030 to sustain current production and manage the decommissioning of ageing platforms. The demand for 'multi-skilled' technicians who are numerate and can handle data analytics is particularly high, with starting salaries for offshore technicians often exceeding £40,000, rising to over £60,000 with experience, making it one of the most lucrative early-career paths for those with strong mathematical skills.

Real-World Impact: Oil and gas technicians are critical to maintaining the UK's energy security. By ensuring the safe and efficient operation of platforms like the Forties Pipeline System or the Shetland Gas Plant, they help power millions of UK homes and businesses, while contributing billions of pounds in tax revenue to the Treasury. The mathematical precision in their work directly prevents catastrophic environmental disasters, protecting fragile North Sea ecosystems and coastal communities. Furthermore, their skills in process control and maintenance are now being directly transferred to the burgeoning offshore wind sector, where they are helping the UK achieve its net-zero carbon targets by applying the same rigorous mathematical logic to maintain turbines in the Dogger Bank wind farm, the world's largest.