MATRIX
QUANTUM

HRD CORP
HUMAN RESOURCE DEVELOPMENT CORPORATION

HRD CORP CLAIMABLE

10 CEP

**Registration Fee**

**RM 1,620 Per Pax (Inclusive 8% SST) - Ex Matrix Participant**

**RM 1,944 Per Pax (Inclusive 8% SST) - New Participant**

**LIMITED TO 30 APPLICANTS ONLY**

# STEAM TURBINE OPERATION & CONTROL

## MOHD FAUZI BIN MAT RASID

**(STEAM ENGINEER GRADE 1)**

# INQUIRE NOW

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**5-6 NOVEMBER 2026**

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**MATRIX QUANTUM SDN. BHD.** 202201044306 (1490003-X)
Lot 180, Jalan 1A, Kampung Baru Subang,
40150 Shah Alam, Selangor Darul Ehsan.
Tel: 03-58926806 Email: matrixquantum88@gmail.com

# TRAINING SCHEDULE & OUTLINE

| | |
|---|---|
| **Course Tittle** | **Steam Turbine Operation & Control** |
| **Training Provider** | **Matrix Quantum Sdn Bhd** |
| **Duration** | **2 Days** |
| **Date** | **TBA** |
| **Time** | **8.30am – 5.00pm** |

**About the Training:**

Empowering your engineering team to master the high-stakes environment of steam turbine management. Focusing on the absolute precision of startup sequences and the technical integrity of the protection matrix, this program ensures your turbine operates at peak efficiency with zero unplanned downtime. Unlike general mechanical courses, this training bridges the gap between complex thermodynamics and real-world operational control, safeguarding your plant's most valuable rotating asset.

**Training Outcomes:**

Upon completion of this training, participants will be equipped to immediately implement best practices of:

1) **Analyze** the fundamental principles of the Rankine Cycle and how steam turbines convert thermal energy into mechanical power.
2) **Identify** the mechanical functions and material constraints of major turbine components, including rotors, casings, and blading.
3) **Execute** standardized startup sequences (Cold, Warm, and Hot) while managing thermal expansion and eccentricity.
4) **Master** the operation of the Turbine Control System (Governor) for precise speed and load management.
5) **Evaluate** the critical role of auxiliary systems, such as Lube Oil, Gland Steam, and Vacuum systems, in turbine reliability.
6) **Implement** safe shutdown and cooldown protocols, including the strategic use of turning gears to prevent rotor bowing.
7) **Identify** and mitigate the root causes of turbine trips through a deep understanding of the Protection Matrix.
8) **Optimize** turbine efficiency by monitoring exhaust vacuum, steam quality, and extraction parameters.
9) **Apply** advanced preservation techniques for turbines in standby mode to prevent internal corrosion and pitting.
10) **Formulate** emergency response strategies for critical scenarios such as overspeed, high vibration, or loss of vacuum.

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| | TIME | DESCRIPTION | REMARK |
|---|---|---|---|
| **DAY 1** | 8.30-8.45 | REGISTRATION DAY 1 | |
| | 8.45-9.00 | INTRODUCTION AND ICE BREAKING | |
| | 9.00-10.30 | MODULE 1 | |
| | 10.30-11.00 | TEA BREAK | |
| | 11.00-12.30 | MODULE 2 | |
| | 12.30-14.00 | LUNCH AND ZOHOR PRAYER BREAK | |
| | 14.00-15.30 | MODULE 3 | |
| | 15.30-15.45 | TEA BREAK | |
| | 15.45-17.15 | MODULE 4 | |
| | 17.15 | ADJOURN DAY 1 | |
| **DAY 2** | 8.30-8.45 | REGISTRATION DAY 2 | |
| | 8.45-9.00 | RECAP OF PREVIOUS DAY LESSONS | |
| | 9.00-10.30 | MODULE 5 | |
| | 10.30-11.00 | TEA BREAK | |
| | 11.00-12.30 | MODULE 5 | |
| | 12.30-14.00 | LUNCH AND ZOHOR PRAYER BREAK | |
| | 14.00-15.30 | MODULE 6 | |
| | 15.30-15.45 | TEA BREAK | |
| | 15.45-17.15 | MODULE 6 | |
| | 17.15 | END OF COURSE | |

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# MODULE OUTLINE DETAILS

## 1. MODULE 1 – INTRODUCTION TO STEAM TURBINE

1) **History**
   Tracing the evolution of steam turbine technology from early industrial designs to the high-efficiency supersonic units utilized in modern power plants.
2) **Steam Turbine Fundamental**
   Exploring the core thermodynamic principles of converting high-pressure steam energy into rotational mechanical force through impulse and reaction physics.
3) **Steam Turbine In Rankine Cycle**
   Analyzing the turbine's critical role as the work-extracting component within the Rankine Cycle and its impact on overall plant thermal efficiency.
4) Steam Turbine Types
   Classifying turbines based on steam flow direction, exhaust conditions and the strategic use of extraction points for process heating.
5) **Steam Turbine Arrangements**
   Evaluating various mechanical configurations, including single-casing, tandem-compound, and cross-compound designs to meet specific power and space requirements.

## 2. MODULE 2 – STEAM TURBINE MAJOR COMPONENTS

1) **Casing**
   Examining the structural integrity of the turbine shell, designed to contain high-pressure steam and maintain internal clearances under extreme thermal conditions.
2) **Blade**
   Analyzing the aerodynamic design and material properties of stationary and moving blades required to extract maximum kinetic energy from the steam flow.
3) **Rotor**
   Understanding the engineering of the central shaft assembly and its critical role in transmitting mechanical torque while resisting centrifugal and thermal stresses.
4) **Bearings**
   Evaluating the function of journal and thrust bearings in supporting the rotor's weight and maintaining precise axial and radial positioning during high-speed rotation.
5) **Turning Gear**
   Mastering the importance of the barring system in providing slow, continuous rotation to prevent thermal distortion and "rotor bowing" during startup and cooldown.

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## 3. MODULE 3 – HRSG START UP

1) **Turning Gear**
   Mastering the transition from zero speed to barring gear operation to ensure uniform rotor temperature and the elimination of eccentricity before steam admission**.**
2) **Warm UP**
   Executing controlled low-speed steam admission to gradually heat the casing and rotor, ensuring all components expand evenly to maintain critical internal clearances
3) **High Speed Heat Soaking**
   Managing the strategic "dwell" periods at intermediate speeds to allow deep thermal penetration into the rotor metal before accelerating to rated RPM.
4) **Idle**
   Monitoring turbine stability and auxiliary system performance during the "Ready to Sync" phase while maintaining constant speed and vacuum integrity.
5) **Synchronizing**
   Coordinating the final alignment of turbine frequency, phase, and voltage with the grid or process header for a seamless and safe electrical connection.

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## 4. MODULE 4 – STEAM TURBINE CONTROLLER

1) **Controller Task**
   Mastering the core objectives of the turbine control system in maintaining precise rotational speed, governing steam flow, and responding to dynamic load demands.
2) **Typical Controller in HRSG**
   i. **Speed Controller**
   ii. **Load Controller**
   iii. **Pressure Controller**
   iv. **Steam Admission Controller**

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**5. MODULE 5 – STEAM TURBINE PROTECTION**

1) **Major Steam Turbine Protection**

   Mastering the critical matrix of safety interlocks and rapid-response trip logic—including overspeed, low vacuum, high vibration, and axial displacement—to prevent catastrophic mechanical failure and ensure immediate asset protection.

   I. **Overspeed**
   II. **Steam Temperature HIGH**
   III. **Wet Steam Monitoring**
   IV. **Exhaust Temperature Monitoring**
   V. **Casing Distortion Monitoring**
   VI. **Vibration Supervision**
   VII. **Pressure Condenser**
   VIII. **Condenser Hot well Level**
   IX. **Generator & Transformer Protection**
   X. **Fire Protection**

**6. MODULE 6 – STEAM TURBINE SHUTDOWN**

1) **De-synchronized**

   Executing a controlled load reduction and safely opening the circuit breaker to decouple the generator from the grid while maintaining turbine speed stability.

2) **Turbine shutdown**

   Implementing the final steam isolation by closing the Main Stop and Control Valves to initiate the transition from powered rotation to a coast-down state.

3) **Turbine Cooling**

   Managing the critical cooldown phase by engaging the turning gear to ensure uniform heat dissipation and prevent rotor distortion as internal temperatures drop.

4) **Vacuum Breaking**

   Strategically admitting air into the condenser at the appropriate rotor speed to provide aerodynamic braking and accelerate the final stage of the shutdown sequence.

5) **Oil System OFF**

   Determining the safe temperature thresholds and rotor status required before deactivating the auxiliary lube oil pumps to ensure bearing protection throughout the cooling cycle.