COURSE OVERVIEW PE1066
Hydrocracking Process Technology (Advanced)

Course Title
Hydrocracking Process Technology (Advanced)

Course Date/Venue
June 22-26, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Reference
PE1066

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Hydrocracking Process Technology (Advanced). It covers the advanced hydrocracking, feedstock characteristics and preparation; the hydrocracking reaction chemistry, process configuration and flow schemes including operating conditions and optimization; the hydrogen consumption estimation, hydrogen recycle systems, makeup and purge streams and integration with hydrogen network; and the advanced catalyst fundamentals, catalyst selection and performance as well as reactor design and internals.

Further, the course will also discuss the reactor operation and monitoring, temperature and pressure control, hydrocracking unit simulation tools and fractionation section design; the product yield optimization, product quality control and on-spec product management; the recycle streams and unconverted oil, fouling and corrosion in fractionation and common operational problems; the root cause analysis techniques, data collection and pattern recognition; the process imbalance diagnosis and debottlenecking techniques; and the revamp and retrofit options, turnaround planning and execution.

During this interactive course, participants will learn the instrumentation and control system enhancements, process safety management in hydrocracking and environmental compliance and emissions; the heat recovery networks, pinch analysis and steam integration; the hydrogen and fuel gas balance and utilities cost optimization; the renewable feedstock co-processing and AI and digital twins in unit operation; and the advanced catalyst development, net-zero refinery and hydrocracker role

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an advanced knowledge on hydrocracking process technology
- Discuss advanced hydrocracking, feedstock characteristics and preparation
- Explain hydrocracking reaction chemistry, process configuration and flow schemes including operating conditions and optimization
- Carryout hydrogen consumption estimation, hydrogen recycle systems, makeup and purge streams and integration with hydrogen network
- Discuss advanced catalyst fundamentals, catalyst selection and performance as well as reactor design and internals
- Employ reactor operation and monitoring and temperature and pressure control and identify hydrocracking unit simulation tools and fractionation section design
- Apply product yield optimization, product quality control and on-spec product management
- Discuss recycle streams and unconverted oil, fouling and corrosion in fractionation and common operational problems
- Carryout root cause analysis techniques, data collection and pattern recognition and process imbalance diagnosis
- Employ debottlenecking techniques, revamp and retrofit options, turnaround planning and execution
- Apply instrumentation and control system enhancements, process safety management in hydrocracking and environmental compliance and emissions
- Recognize heat recovery networks, pinch analysis and steam integration, hydrogen and fuel gas balance and utilities cost optimization
- Describe renewable feedstock co-processing, AI and digital twins in unit operation, advanced catalyst development and net-zero refinery and hydrocracker role

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of advanced hydrocracking process technology for process engineers, project engineers and designers, technical managers and refinery planners, operations supervisors and senior operators, catalyst and process technology specialists, consultants and advisors, researchers and R&D personnel and other technical staff.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. John Petrus, PhD, MSc, BSc, is a **Senior Petroleum & Process Engineer** with over **30 years** of **onshore & offshore** experience within the **Oil & Gas**, **Refinery** and **Petroleum** industries. His wide experience covers in the areas of **Advanced Operational & Troubleshooting Skills**, **Advanced Operator** Responsibilities, (**CRU**) Advanced Operation, **Oil Field** Operations, **Oil & Gas** Operations & Troubleshooting, **Operations & Maintenance** for Typical Gas Processing Plant, **Pressure Vessel** Operation, Operations Abnormalities & Plant Upset, Principles of Operations Planning, **Asset Operational Integrity** for Operations – Intermediate, **Plant & Equipment Integrity**, **Gas** Processing, **Gas & Condensate** Analysis, **Gas Sweetening Process** at Upstream Oil & Gas, **De-Sulfurization** Technology, **Gasoline Blending** for Refineries, **Chemical** Engineering, **Process Troubleshooting**, **Distillation Towers**, **Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Distillation Column** Operation & Control, **Oil Movement** Storage & Troubleshooting, **Process Equipment** Design, Applied **Process Engineering** Elements, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Monitoring, **Catalyst** Selection & Production Optimization, **Process Plant** Start-up & Commissioning, **Clean Fuel** Technology & Standards, Flare, Blowdown & Pressure Relief Systems, **Oil & Gas Field Commissioning** Techniques, **Process Reactors** Start-Up & Shutdown, **Urea Manufacturing** Process Technology, Continuous Catalytic Reformer (**CCR**), **Rotating Equipment** Maintenance & Troubleshooting. Further he is also well versed in **Drill String Design & Drilling** Optimization, **Drill String Design** Calculations, **Formation Damage & Acid Stimulation**, **Production Technology** & Engineering, **Horizontal & Multilateral Wells**, **Well Completions**, **Well Logs**, **Well Stimulation** & **Production Logging**, **Well Completion** Design & Operation, Well Surveillance, **Well Testing**, **Well Stimulation** & Control and **Workover** Planning, **Completions & Workover**, Hole Cleaning & Logging, Servicing and **Work-Over** Operations, **Wellhead** Operations, Maintenance & Testing, Petrophysics/Interpretation of Well Composite, **Reservoir & Tubing** Performance, Practical **Reservoir** Engineering, Clastic **Exploration & Reservoir Sedimentology**, **Carbonate Reservoir Characterization** & Modeling, **Seismic Interpretation**, **Mapping & Reservoir** Modelling, **Reservoir Geology**, Integrating **Geoscience** into **Carbonate Reservoir** Management, **Faulted & Fractured Reservoirs**, **Fractured Hydrocarbon Reservoirs**, Analyses, Characterisation & Modelling of **Fractured Reservoirs & Prospects**, **Fracture Reservoir** Modeling Using **Petrel**, **Reservoir** Engineering Applied Research, **Artificial Lift**, **Artificial Lift System** Selection & Design, Electrical Submersible Pumps (**ESP**), Enhance Oil Recovery (**EOR**), **Oil In Place** (**OIP**) **Estimation & Range of Uncertainty**, **Hydraulic Fracturing**, **Sand Control** Techniques, **Perforating** Methods & Design, **Perforating** Operations, **Petroleum** Exploration & Production, **Hydrocarbon Exploration** & Production, Exploration & Production, **Play Assessment & Prospect Evaluation**, **Formation** Evaluation, **Petroleum Engineering** Practices, **Petroleum** Hydrogeology & Hydrodynamics, **Project** Uncertainty, Decision Analysis & Risk Management, **Decision Analysis & Uncertainty** Management, **Exploration & Development Geology**, **Sedimentology & Sequence Stratigraphy**, **Structural Interpretation** in Exploration & Development, **Petrel Geology**, **Geomodeling**, **Structural Geology**, **Applied Structural Geology** in Hydrocarbon Exploration, **Petrophysics** and **Geology** of the Oil & Gas Field.. Further, he is also well-versed in **seismic interpretation**, **mapping** & **reservoir modelling tools** like **Petrel** software, **LandMark**, **Seisworks**, **Geoframe**, **Zmap** and has extensive knowledge in MSDos, Unix, **AutoCAD**, MAP, Overlay, Quicksurf, 3DStudio, **Esri ArcGIS**, Visual Lisp, Fortran-77 and Clipper. Moreover, he is a world **expert** in **analysis** and **modelling** of **fractured prospects** and **reservoirs** and a **specialist** and **developer** of **fracture modelling software tools** such as FPDM, FMX and DMX Protocols.

During his career life, Dr. Petrus held significant positions and dedication as the **Executive Director**, **Senior Geoscience Advisor**, **Exploration Manager**, **Project Manager**, **Manager**, **Process Engineer**, **Mechanical Engineer**, **Maintenance Engineer**, **Chief Geologist**, **Chief** of **Exploration**, **Chief** of **Geoscience**, **Senior Geosciences Engineer**, **Senior Explorationist**, **Senior Geologist**, **Geologist**, **Senior Geoscientist**, **Geomodeller**, **Geoscientist**, **CPR Editor**, **Resources Auditor**, **Project Leader**, **Technical Leader**, **Team Leader**, **Scientific Researcher** and **Senior Instructor/Trainer** from various international companies and universities such as the Dragon Oil Holding Plc., ENOC, MENA, ENI Group of Companies, Ocre Geoscience Services (OGS), Burren RPL, Ministry of Oil-Iraq, Eni Corporate University, Standford University, European Universities, European Research Institutes, NorskHydro Oil Company, Oil E&P Companies, just to name a few.

Dr. Petrus has a **PhD** in **Geology** and **Tectonophysics** and **Master** and **Bachelor** degrees in **Earth Sciences** from the **Utrecht University**, **The Netherlands**. Further, he is a **Certified Instructor/Trainer**, a **Certified Trainer/Assessor/Internal Verifier** by the **Institute of Leadership & Management** (**ILM**), a Secretary and Treasurer of Board of Directors of Multicultural Centre, Association Steunfonds SSH/SSR and Founding Member of Sfera Association. He has further published several scientific publications, journals, research papers and books and delivered numerous trainings, workshops, courses, seminars and conferences internationally.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 22nd of June 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Advanced Hydrocracking*** *Historical Development of Hydrocracking • Comparison with Catalytic Cracking and Hydrotreating • Key Objectives in Modern Refineries • Role in Refinery Configuration and Economics*
0930 – 0945	*Break*
0945 – 1030	***Feedstock Characteristics & Preparation*** *Types of Feedstocks (VGO, DAO, etc.) • Feed Impurities: Sulfur, Nitrogen, Metals • Impact of Feed Composition on Catalyst Life • Pre-Treatment and Hydrotreating Integration*
1030 – 1130	***Hydrocracking Reaction Chemistry*** *Hydrogenation and Cracking Reactions • Saturation of Aromatics • Isomerization Reactions • Reaction Pathways and Product Selectivity*
1130 – 1215	***Process Configuration & Flow Schemes*** *Single-Stage versus Two-Stage Hydrocracking • Series and Parallel Reactor Configurations • Integration with Upstream/Downstream Units • Layout Optimization for Flexibility and Yield*
1215 – 1230	*Break*
1230 – 1330	***Operating Conditions & Optimization*** *Pressure and Temperature Ranges • Hydrogen Partial Pressure Effects • Liquid Hourly Space Velocity (LHSV) • Optimization of Conversion versus Selectivity*

1330 – 1420	***Hydrogen Management*** *Hydrogen Consumption Estimation • Hydrogen Recycle Systems • Makeup and Purge Streams • Integration with Hydrogen Network*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: ***Monday, 23rd of June 2025***

0730 – 0830	***Advanced Catalyst Fundamentals*** *Bifunctional Catalyst Nature • Metal and Acid Function Synergy • Common Metals: NiMo, CoMo, Pt, Pd • Catalyst Deactivation Mechanisms*
0830 - 0930	***Catalyst Selection & Performance*** *Criteria for Catalyst Selection • Activity, Selectivity, and Stability • Catalyst Screening and Testing • Influence of Feed Type on Catalyst Performance*
0930 – 0945	*Break*
0945 – 1100	***Reactor Design & Internals*** *Fixed-Bed Reactor Design Principles • Flow Distribution Systems • Quench Zone Design • Thermal Management in Exothermic Reactions*
1100 – 1215	***Reactor Operation & Monitoring*** *Start-Up and Shutdown Procedures • Online Monitoring and Diagnostics • Detecting Maldistribution and Hot Spots • Adjusting Operating Parameters*
1215 – 1230	*Break*
1230 – 1330	***Temperature & Pressure Control*** *Use of Interbed Quenching • Importance of Reactor Temperature Profile • Pressure Drop Monitoring • Equipment for Pressure and Temperature Control*
1330 – 1420	***Hydrocracking Unit Simulation Tools*** *Process Modeling Basics • Use of Aspen HYSYS, PRO/II • Reaction Kinetics Models • Sensitivity Analysis and Case Studies*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: ***Tuesday, 24th of June 2025***

0730 – 0830	***Fractionation Section Design*** *Fractionator Column Internals • Cut Point Selection (Naphtha, Diesel, VGO) • Stripper and Debutanizer Roles • Heat Integration in Fractionation*
0830 – 0930	***Product Yield Optimization*** *Target Product Distributions • Diesel, Kerosene, and Naphtha Specifications • Conversion versus Selectivity Trade-Offs • Maximizing Middle Distillates*
0930 – 0945	*Break*
0945 – 1100	***Product Quality Control*** *Octane, Cetane, and Density Control • Aromatics and Sulfur Content • Flash Point and Freezing Point Checks • Product Blending Considerations*
1100 – 1215	***On-Spec Product Management*** *Online Analyzers and Sensors • Sampling and Lab Testing Procedures • Real-Time Process Adjustments • Control Systems Integration*
1215 – 1230	*Break*

1230 – 1330	***Recycle Streams & Unconverted Oil*** *Unconverted Oil (UCO) Handling • Slurry and Bottoms Upgrading • Managing Recycle Ratio • Impact on Unit Fouling and Capacity*
1330 – 1420	***Fouling & Corrosion in Fractionation*** *Hot Spots and Polymerization Issues • Corrosive Environments and Materials Selection • Preventive Maintenance Techniques • Online Monitoring of Corrosion*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 25th of June 2025

0730 – 0830	***Common Operational Problems*** *Catalyst Deactivation • Poor Fractionation Efficiency • Temperature Runaway Risks • Feed Quality Variability*
0830 – 0930	***Troubleshooting Methodologies*** *Root Cause Analysis Techniques • Data Collection and Pattern Recognition • Process Imbalance Diagnosis • Case Histories and Real Scenarios*
0930 – 0945	*Break*
0945 – 1100	***Debottlenecking Techniques*** *Identifying Unit Constraints • Reactor, Compressor, and Fractionator Upgrades • Utility and Hydrogen Limitations • Incremental Capacity Gains*
1100 – 1215	***Revamp & Retrofit Options*** *Increasing Conversion Capacity • Feedstock Flexibility Enhancements • Catalyst System Upgrades • Integration with Renewable Feed Processing*
1215 – 1230	*Break*
1230 – 1330	***Turnaround Planning & Execution*** *Inspection Scope and Planning • Catalyst Changeout Protocols • Safety and Environmental Compliance • Lessons Learned Documentation*
1330 – 1420	***Instrumentation & Control System Enhancements*** *Advanced Process Control (APC) • Alarm Management Systems • Predictive Maintenance Tools • Data Historian and DCS Integration*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

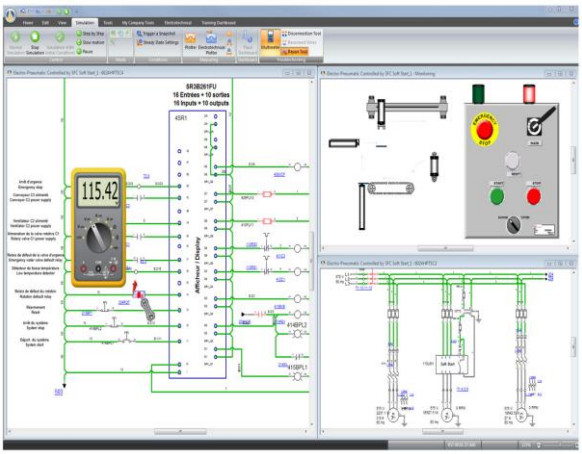
Day 5: Friday, 26th of June 2025

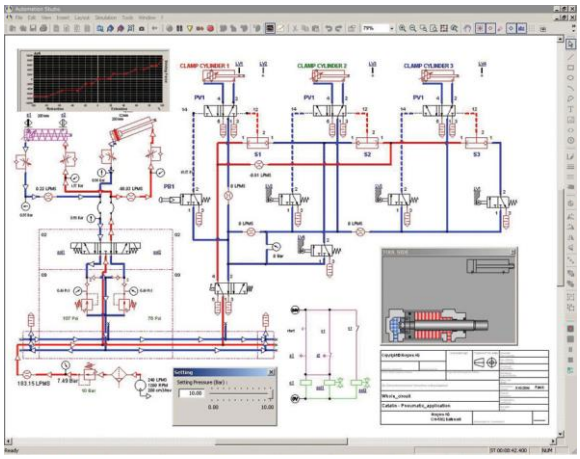
0730 – 0830	***Process Safety Management in Hydrocracking*** *HAZOP and LOPA for Hydrocracking Units • High-Pressure Hydrogen System Risks • Fire and Explosion Protection • Safety Instrumentation and Shutdown Systems*
0830 – 0930	***Environmental Compliance & Emissions*** *Sulfur Recovery and Emissions Control • Wastewater and Sour Water Treatment • CO_2 and Flare Gas Reduction • Environmental Monitoring Systems*
0930 – 0945	*Break*

0945 – 1100	***Energy Integration & Efficiency*** *Heat Recovery Networks • Pinch Analysis and Steam Integration • Hydrogen and Fuel Gas Balance • Utilities Cost Optimization*
1100 – 1215	***Case Studies & Benchmarking*** *High-Conversion Unit Performance • Reactor Revamp Outcomes • Product Yield Improvement Success Stories • Catalyst Trial Results*
1215 – 1230	*Break*
1230 – 1345	***Future Trends in Hydrocracking*** *Renewable Feedstock Co-Processing • AI and Digital Twins in Unit Operation • Advanced Catalyst Development • Net-Zero Refinery and Hydrocracker Role*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

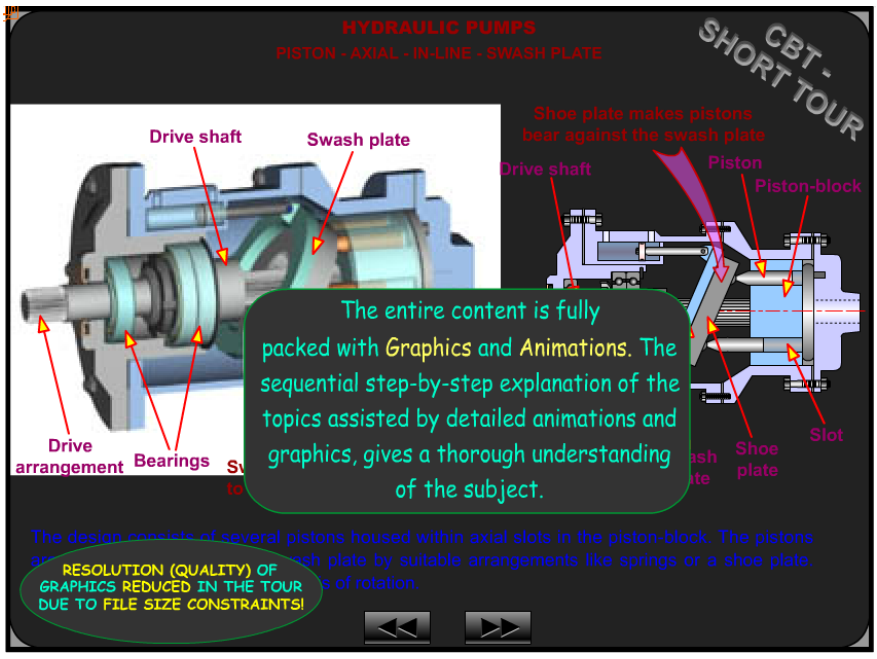
Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the "Automation Studio (Hydraulic & Pneumatic Software)" and "Industrial Hydraulic Software".





"Automation Studio (Hydraulic & Pneumatic Software)"



Industrial Hydraulics Software

Course Coordinator

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