



Chlor-Alkali Plant Operations Course: Brine Purification, Membrane Cells and Chlorine Handling



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Introduction:

Chlor-Alkali Plant Operations Course covering brine purification, membrane cells and chlorine handling is a 5-day course for process, operating and maintenance staff in chlorine and caustic soda plants, ending with a Cell Room Performance and Safety Review for a case plant. Plants lose power, membranes and saleable output when brine impurities, cell voltage drift and chlorine train upsets are noticed late. Nominees already run or maintain electrolyzers, brine treatment or chlorine units and learn through inspection walkthroughs of cell room, chlorine and caustic sections. CoreConcept Training Center delivers this chlor-alkali plant operations course.

Course Objectives:

- Explain the chlor-alkali reactions, cell technologies and product chains and set an operating baseline for load, voltage and energy per tonne
- Control salt dissolving, primary brine treatment and ion exchange polishing so that brine reaching the membrane cells stays within impurity limits
- Operate membrane electrolyzers to hold cell voltage, current efficiency and anolyte conditions within the window set by the plant
- Run chlorine cooling, drying, compression and liquefaction, hydrogen handling and caustic evaporation without off-specification product or trips
- Recognise membrane damage, nitrogen trichloride build-up, hydrogen hazards and chlorine leaks and apply detection and emergency response arrangements
- Prepare a cell room performance and safety review that ranks energy, membrane life and chlorine safety actions for a case plant

Target Audience:

- Process engineering staff responsible for cell room performance, brine quality and energy reporting
 - Control room operating staff responsible for electrolyser load, cell voltage alarms and chlorine header pressure
 - Field operating staff responsible for brine treatment, chlorine drying and caustic evaporation equipment
 - Maintenance staff responsible for electrolyser element renewal, membrane change-out and chlorine service equipment
 - Shift leading staff responsible for permits, chlorine leak response and handover in the cell room and chlorine areas
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Course Outline:

Day 1: Chlor-Alkali Process Chemistry, Products and Plant Baseline

- Chlor-Alkali Electrolysis Reactions and Chlorine Caustic Hydrogen Co-Products
- Membrane, Diaphragm and Mercury Cell Technologies Compared for Operators
- Chlorine and Caustic Soda Product Chains Including EDC and VCM
- Electrochemical Unit Balance Linking Chlorine, Caustic and Hydrogen Output
- Plant Baseline Sheet for Load, Voltage and Energy per Tonne

Day 2: Brine Purification and Membrane Electrolyser Design

- Salt Dissolving, Brine Saturation and Solid Salt Quality Checks
- Primary Brine Treatment by Precipitation, Clarification and Filtration
- Secondary Brine Purification with Chelating Ion Exchange Resin Columns
- Perfluorinated Cation Exchange Membrane Structure and Sodium Ion Transport
- Bipolar and Monopolar Electrolyser Elements, Anodes and Activated Cathodes

Day 3: Cell Room Operation, Chlorine Processing and Caustic Finishing

- Cell Voltage, Current Efficiency and Anolyte pH Control Routines
- Rectifier Load Ramping and DC Power Interface at Management Level
- Wet Chlorine Cooling and Sulphuric Acid Drying Tower Operation
- Chlorine Compression, Liquefaction and Tail Gas Absorption to Hypochlorite
- Multiple-Effect Caustic Evaporation from Cell Liquor to Flake Grade

Day 4: Hydrogen, By-Product Units, Membrane Life and Chlorine Safety

- Hydrogen Cooling, Compression and Oxygen-in-Hydrogen Explosion Limits
- Sodium Hypochlorite Reactor and HCl Synthesis Burner Operation
- Membrane Life Trending, Brine Impurity Damage and Element Renewal
- Nitrogen Trichloride Hazard, Chlorine Detectors and Leak Alarm Coverage
- Chlorine Industry Association Guidance on Emergency Plans and Repair Kits

Day 5: Inspection Walkthrough and Cell Room Performance and Safety Review

- Case Plant Cell Room Walkthrough Against Voltage and Efficiency Criteria
 - Case Brine Plant Data Review Against Hardness and Iodine Limits
 - Case Chlorine and Hydrogen Train Hazard Inspection Using Checklists
 - Energy KPI Gap Analysis in kWh per Tonne of Caustic
 - Cell Room Performance and Safety Review Completion and Peer Challenge
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Skills You Will Gain:

- Brine Purity Control
- Membrane Electrolyser Performance Analysis
- Chlorine Drying and Liquefaction Operation
- Caustic Evaporation Control
- Hydrogen Hazard Management
- Chlorine Leak Detection and Response
- Specific Energy Consumption Tracking
- Membrane Life Management

Why Attend This Course:

- Deliver a Cell Room Performance and Safety Review for a case plant to the production manager and the site safety committee
- Decide when a membrane or electrolyser element should be renewed from voltage, efficiency and brine impurity trends
- Avoid membrane damage, chlorine releases and hydrogen-in-chlorine excursions that halt production and expose staff
- Share brine control charts, cell voltage trend sheets and chlorine leak checklists with shift and maintenance colleagues

Conclusion:

Back at work, the participant hands the Cell Room Performance and Safety Review to the production manager, the maintenance planner and the site safety committee. They use it to agree which electrolyzers need element renewal, which brine controls to tighten, how to close energy gaps in kWh per tonne and which chlorine and hydrogen safeguards to upgrade. After the first quarter of use, the unit should compare cell voltage, current efficiency, membrane failures and leak alarm records against the review and reset its priorities where results differ.

Frequently Asked Questions FAQ:

What should participants know before the chlor-alkali plant operations course?

Participants should already work in a cell room, brine plant, chlorine or caustic section and read process trends. Bringing anonymised cell voltage logs, brine analyses or chlorine incident records helps them apply the walkthroughs and the final review to their own plant.

How does chlor-alkali plant operations training differ from a general electrochemistry or electroplating course?

It concentrates on one industrial process, from salt and brine through membrane electrolyzers to chlorine, hydrogen and caustic soda handling. General electrochemistry courses cover many cell types and plating baths but not brine purification, chlorine liquefaction or chlorine emergency arrangements.

Why does brine purity matter so much in chlor-alkali plant operations with membrane cells?

Hardness ions and other impurities deposit inside the ion exchange membrane, raising cell voltage, lowering current efficiency and shortening membrane life. Primary treatment and ion exchange polishing keep these impurities low, protecting both energy consumption and membrane replacement budgets.

What do participants take back from the chlor-alkali plant operations course?

Each participant takes back a Cell Room Performance and Safety Review for a case plant, with ranked energy, membrane life and chlorine safety actions, plus checklists and trend sheets that can be adapted to their own electrolyzers and chlorine units.