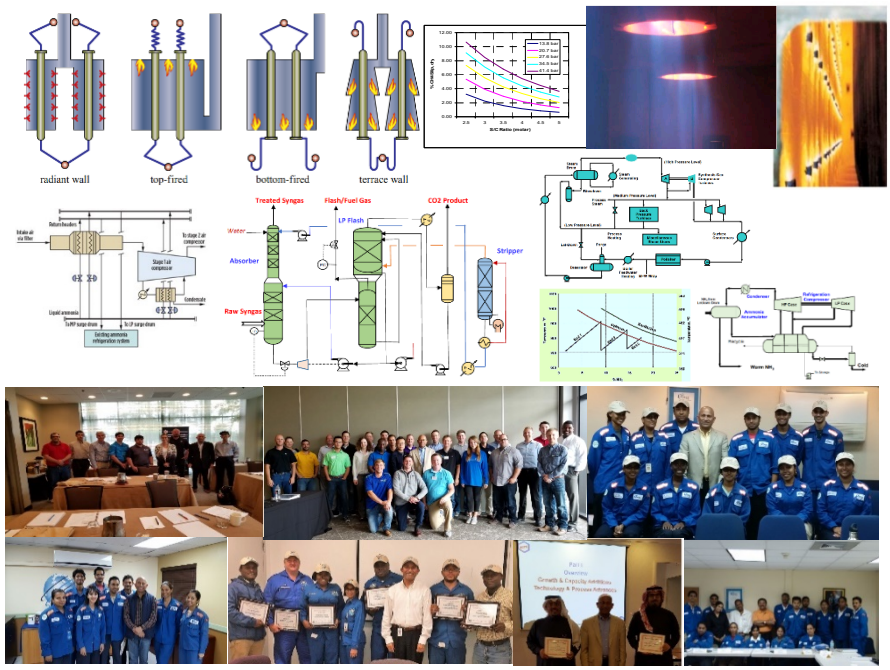


Ammonia Production & Troubleshooting Training

Including

Best Practices
Lessons Learned
Equipment Monitoring
Improvements Tips
(Customized, as needed)

SIMPLE PRACTICAL IMPROVEMENTS & TROUBLESHOOTING TIPS

AMMONIA TRAINING SINCE 2006

Ammonia Plant Training Workshop

by Kinetics Process Improvements, Houston

OBJECTIVE: ***The comprehensive workshop provides practical insights with a focus on process, reforming, troubleshooting, performance improvements in Ammonia Plants to improve monitoring, maintenance, reliability & safety***

OVERVIEW

- Process & Technology advances
- Process configurations & analysis
- Best Practices

PROCESS & TROUBLESHOOTING

- Improve Reforming performance
- Minimizing inerts in MUG
- Minimizing pressure drop
- Improve Compressor capacity
- Improve CO2 removal performance
- Improve Mol. Sieve performance
- Cryogenic Purifier modeling & issues
- Optimize Synloop for max production
- Improve Ammonia Refrigeration
- Improve Steam system
- Process monitoring techniques
- Case studies/Lessons learnt
- Plant Modeling & Evaluation

CATALYST CONSIDERATIONS

- Feed Purification
- Reforming- Pre/Primary/Secondary
- Shift- LTS/HTS
- Methanation
- Ammonia Synthesis

PRIMARY REFORMER

- Thermodynamics and Chemistry
- Reformer Arrangements
- All about Radiant Tubes
- Critical design features
- Key Operating Variables
- Burners, Draft & Combustion
- Air Preheater & considerations
- Controls & Safety Systems
- NOx mitigation- pre- & post treatment
- Startup & Shut down consideration
- Re-harping considerations
- Catalyst evaluation techniques
- Efficiency evaluation & monitoring

AMMONIA SYNLOOP

- Converter types & Loop configurations
- Ammonia Refrigeration
- Optimize loop for max production
- H2 recovery improvements

PERFORMANCE MONITORING

- Primary Reformer Heat Balance, ATE
- Reformer Thermal Efficiency
- Compressor/Turbine Efficiency
- Heat Exchanger/Convection Fouling

Kinetics Process Improvements, Inc.
16000 Park Ten Pl., Suite 903,
Houston, TX 77084 (USA)
Phone: (+1) 281 773 1629
Fax: (+1) 832 565 9360
Email: process@kpieng.com
Web: kpieng.com, kpieng.net

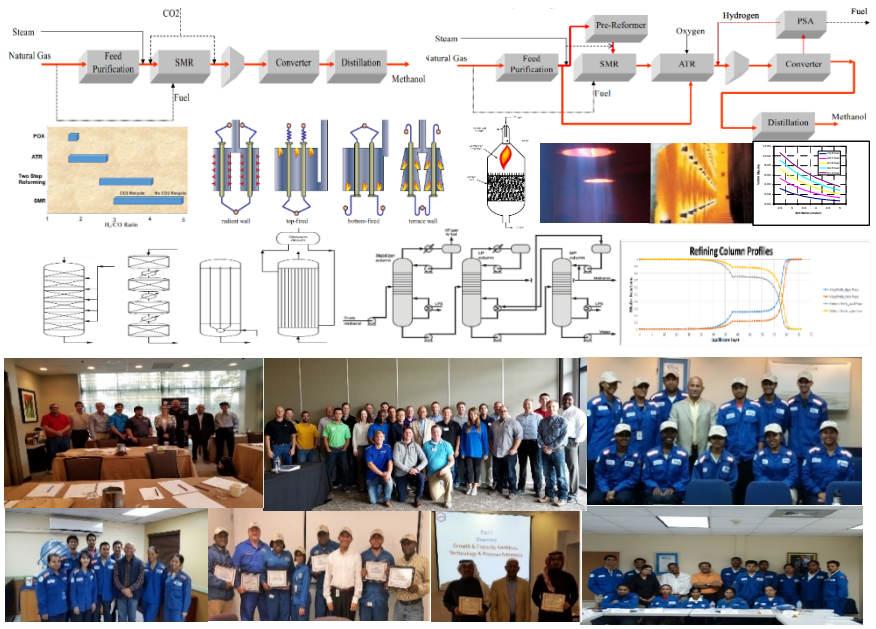
TRAINING FORMAT

- ***Interactive Q&A for practical learning***
- ***What-if scenarios for improvements***
- ***Analysis of Practical Case Studies***
- ***Models to demo Plant sensivity***
- ***Simple to follow Training material***

TARGET GROUP

- ***Process/Operation Engr's***
- ***Production Sup'dt/Supervisors***
- ***Project/Mechnaical Engineers***
- ***Reliability & Safety Engineers***
- ***Business Development/Analysts***

REFERENCES: ***CFI. PCS. SABIC. CNC. N2000. PLNL. AUM. ADVANSIX. MOSAIC*** *(Trained over 500 candidates with many repeats)*



Methanol Production & Troubleshooting Training

Including

Best Practices
Lessons Learned
Equipment Monitoring
Improvements Tips
(Customized, as needed)

SIMPLE PRACTICAL IMPROVEMENTS & TROUBLESHOOTING TIPS

METHANOL TRAINING SINCE 2006

Methanol Plant Training Workshop

by Kinetics Process Improvements, Houston

OBJECTIVE: ***The comprehensive workshop provides practical insights with a focus on process, reforming, troubleshooting, performance improvements in Methanol Plants to improve monitoring, maintenance, reliability & safety***

OVERVIEW

- Process & Technology advances
- Process configurations & analysis
- Best Practices

PROCESS & TROUBLESHOOTING

- Improve Reforming performance
- Minimizing pressure drop
- Improve Compressor capacity
- Optimize Synloop for max production
- Improve Methanol Purification
- Improve Steam system
- Process monitoring techniques
- Case studies/Lessons learnt
- Plant Modeling & Evaluation

CATALYST CONSIDERATIONS

- Feed Purification
- Reforming- Pre/Primary/ATR
- Methanol Synthesis

METHANOL DISTILLATION

- Distillation Schemes
- Methanol quality issues
- Minimize Energy consumption

PRIMARY REFORMER/ATR

- Thermodynamics and Chemistry
- Reformer Arrangements
- All about Radiant Tubes
- Primary & ATR problem issues
- Critical design features
- Key Operating Variables
- Burners, Draft & Combustion
- Air Preheater & considerations
- Controls & Safety Systems
- NOx mitigation- pre-& post treatment
- Startup & Shut down consideration
- Catalyst evaluation techniques
- Efficiency evaluation & monitoring

METHANOL SYNLOOP

- Converter types & Loop configurations
- Optimize loop for max production
- H2 recovery & CO2 addition

PERFORMANCE MONITORING

- Primary Reformer Heat Balance, ATE
- Reformer Thermal Efficiency
- Compressor/Turbine Efficiency
- Heat Exchanger/Convection Fouling

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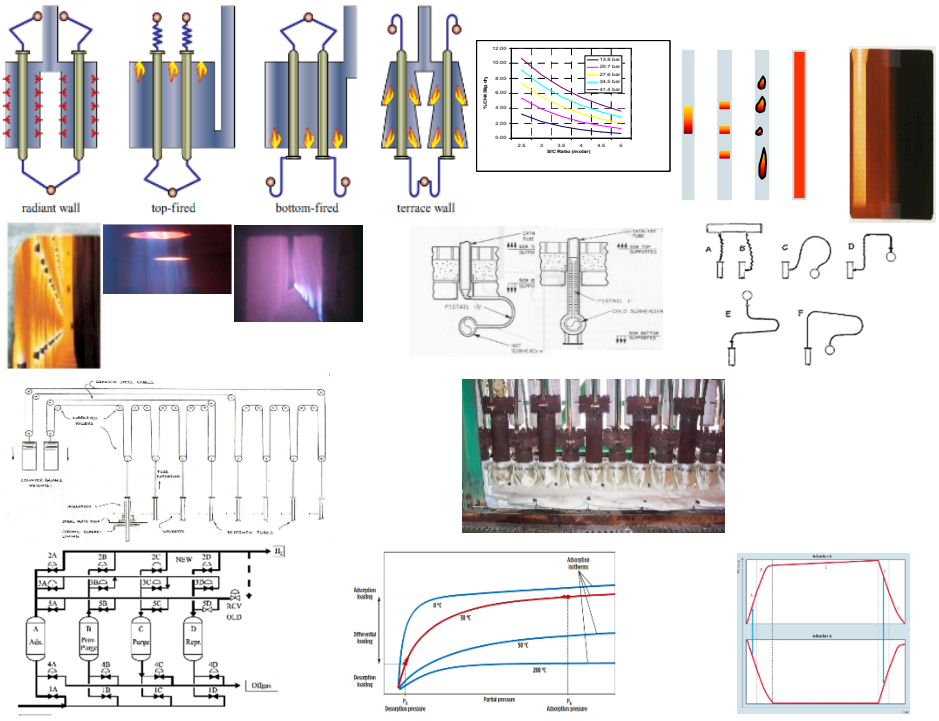
TRAINING FORMAT

- ***Interactive Q&A for practical learning***
- ***What-if scenarios for improvements***
- ***Analysis of Practical Case Studies***
- ***Models to demo Plant sensitivity***
- ***Simple to follow training material***

TARGET GROUP

- ***Process/Operation Engr's***
- ***Production Sup'dt/Supervisors***
- ***Project/Mechnaical Engineers***
- ***Reliability & Safety Engineers***
- ***Business development/Analysts***

REFERENCES: ***METHANOL HOLDINGS, SABIC, METHANEX, CELANESE, AMPCO*** *(Trained over 500 candidates with many repeats)*



Hydrogen/ HyCO Plant Training

Including
Best Practices
Lessons Learned
Equipment Monitoring
Improvements Tips
(Customized, as needed)

CUSTOMIZED TRAINING-WITH SIMULATION OF HYDROGEN/HYCO PLANTS CONFIGURATION

SINCE 2005

Hydrogen/HyCO Plant Training

by Kinetics Process Improvements, Houston

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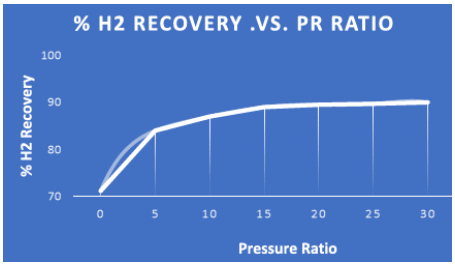

Resources & Expertise

- **Provided Training since 2006**
- **Trained >200 Personnel**
- **Troubleshooting and Design experience in all H2 Plant Configurations/Sizes**

Objectives & Key Benefits

- **To enhance knowledge & understanding of plant operations to improve Reliability & Efficiency**
- **Target group to include Process, Operating/Maintenance Personnel and Engineering**

References

SABIC, Methanex, Methanol Holdings, AMPCO, CNC, PLNL, N2000,AUM,CFI

Brief Course Outline

- **Hydrogen Technology Updates**
- **Feed Pretreatment**
- **Primary/Pre-Reforming**
- **GHR & ATR configurations**
- **Combustion considerations**
- **Waste Heat Recovery**
- **Shift Reactor system**
- **CO2 Removal System**
- **Methanation**
- **Cold box & Membranes**
- **Catalyst Considerations**
- **Hydrogen recovery & improvements**
- **Steam System**
- **Metallurgy Considerations**
- **Environmental Considerations**
- **Reliability Improvements**
- **Improve & Optimize Operations**
- **S/Up & S/Down Considerations**
- **Performance Monitoring-Equipment**
- **Hydrogen network improvements**
- **Hydrogen Plant Model demo**

Kinetics Process Improvements
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Suite#903
Houston- 77084 (USA)
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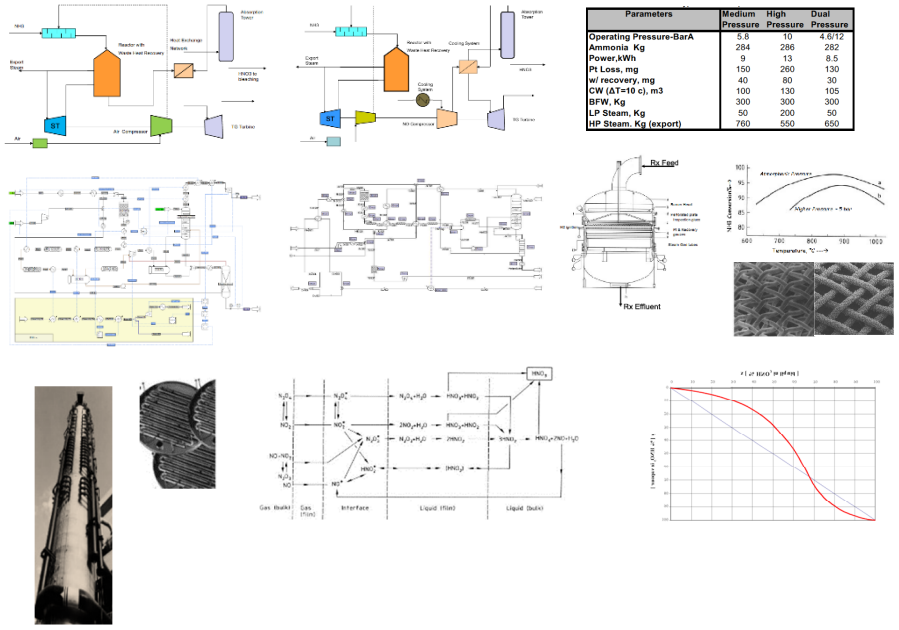
KINETICS PROCESS IMPROVEMENTS
KPI



Nitric Acid Plant Training

Customized with focus on Operational Performance Monitoring to Maximize Production & Reliability

CUTOMIZED TRAINING WITH SIMULATION OF NITRIC ACID PLANT CONFIGURATION

SINCE 2005

Nitric Acid Plant Training

by Kinetics Process Improvements, Houston

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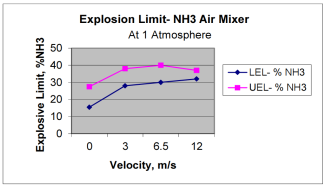

Resources & Expertise

- **Provided Training since 2006**
- **Trained >200 Personnel**
- **Troubleshooting and Design experience in all Nitric Acid Plant Configurations/Sizes**

Objectives & Key Benefits

- **To enhance process knowledge & understanding of plant operations to improve Reliability & Efficiency**
- **Target group to include Process, Operating/Maintenance and Engineering personnel**

References

- MHI-1, MHI-2, CFI

Brief Course Outline

- **Nitric Acid Technology Updates**
- **Nitric Acid Market brief**
- **Reaction Chemistry Oxidation**
- **Reaction Chemistry- Absorption**
- **Ammonia Quality Considerations**
- **Ammonia Vaporization & Filtration**
- **Air Preheat & NH3: Air Mixing**
- **NH3: Air mix Safety Considerations**
- **Oxidation Reactor Configurations**
- **Oxidation Catalyst Considerations**
- **Pt loss & Recovery systems**
- **Start-up Burner issues**
- **Reactor Effluent cooling**
- **Absorption & Bleach operations**
- **Metallurgy & Corrosion Issues**
- **NOx Abatement**
- **Weak NA Pumping issues**
- **NA Storage considerations**
- **Steam System**
- **S/Up & S/Down Considerations**
- **Performance Monitoring-Equipment**
- **Simulation Model demo- Full Plant**

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KINETICS PROCESS IMPROVEMENTS
KPI

Kinetics Process Improvements, Inc.

Independent Consultants & Engineers

Serving to Improve & De-bottleneck

- *Ammonia Plants*
- *Methanol Plants*
- *Primary Reformers*
- *CO2 Removal Systems*

PROJECT FEASIBILITIES

- Technology Evaluation
- Project Cost Estimate
- Risk Assesment
- Due Dilligence
- Economic Evaluation

REVAMP STUDIES

- Capacity/Efficiency Improvements
- Plant Energy Audits
- Reformer Re-ratings
- MIC™ Revamp without major compressor upgrades
- Synloop Optimizer

CUSTOM PROCESS TRAINING

- Process & Technology
- Equipment:
  - Monitoring Techniques
  - Reliability Reviews
- Plant Modeling

PROCESS DESIGN & ENGINEERING

- Basic Engineering Pkg
- Pilot Scale Up
- Process Simulations
- Converter Modeling

Kinetics Process Improvements, Inc.
16000, Park Ten Place, Suite#903, Houston, TX- 77084 (USA)
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E-mail: process@kpieng.com • Web: www.kpieng.com