



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Subodh Medhekar, Ph.D., P.E., CFSE

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### Professional Profile

Dr. Medhekar is a Chemical/Process Engineer with 30+ years of industry experience. Dr. Medhekar applies his experience and expertise to address process issues during the design, construction, commissioning, and operation of industrial facilities. Dr. Medhekar's experience includes oil, gas and Liquefied Natural Gas (LNG) facilities, chemical and petrochemical manufacturing, and process equipment. He also works on addressing risk, reliability, and system integration issues within the Automotive, Consumer Products, Utility/Power, and Nuclear industry sectors. Dr. Medhekar has been called to address process aspects and construction/commissioning delays and opine on the general standard of care for engineering operations, especially with respect to process safety and risk management.

### International Arbitration, Litigation, and EPC Projects

Over the last few years, Dr. Medhekar's practice has increasingly focused on International Arbitration and Litigation projects. For 30+ years previously, his practice involved direct on-site, boots-on-the-ground project work with clients during the design, construction and commissioning phases of large Engineering, Procurement, and Construction (EPC) projects. Dr. Medhekar has evaluated designs and processes for over 100 International Projects with sites in Korea, Japan, Kuwait, the UAE, Saudi Arabia, Qatar, Oman, Singapore, Thailand, Taiwan, India, Malaysia, Indonesia, the UK, Germany, Russia, Poland, Egypt, Mexico, Canada, and the USA. These reviews have involved various project stages, including Front-End Engineering Design (FEED), Detailed Design, Construction, and Commissioning. Dr. Medhekar's clients have included Owners/Operators, EPC contractors, and Project Management Consultants (PMCs).

Having lived and worked on-site – sometimes for months at a time – with project engineers/designers, project managers, commissioning managers, construction operators, and various equipment vendors, Dr. Medhekar has witnessed hundreds of on-site project disputes (and resolutions) and possesses direct and practical engineering project insights. Dr. Medhekar now testifies as an expert witness in International Arbitration cases and litigation matters.

### Project Delays During Construction and Commissioning

Dr. Medhekar has worked on several projects to address process-related issues that lead to project startup/commissioning delays, resulting in project cost overruns. Dr. Medhekar has also performed probabilistic analysis and Monte Carlo simulations to identify critical paths (Critical Path Method (CPM)) within project schedules (Primavera) to identify likely paths that may lead to project delays and cost overruns. Dr. Medhekar has worked with independent Quantum experts to identify and quantify process-related aspects that have led to delays during the startup and commissioning of large EPC projects.

## **Review of Engineering Practices, Unit Operations, and Process Equipment Designs**

Dr. Medhekar has analyzed a variety of process plants, unit operations, and associated scheduled/preventative maintenance activities to evaluate plant performance against Recommended And Generally Accepted Good Engineering Practices (RAGAGEP), owner requirements, and vendor specifications. Dr. Medhekar's projects have involved a wide range of equipment, including chemical reactors and separation systems; pressure vessels, piping, pumps, and compressors; furnaces and heat exchangers; railcars and tanker trucks; and pressure relief valves and emergency relief systems.

## **Root Cause Investigations**

Dr. Medhekar also utilizes his expertise as a chemical engineer in the investigation of accidents, with particular emphasis on safety and risk. He provides consulting services to the chemical and petrochemical process industries (LNG/Natural Gas (NG) and Refinery sectors), specializing in the safety/risk-based evaluation/investigation of process failures – such as process upsets/explosion/fire incidents – at chemical processing and petroleum refining facilities.

## **Process Safety and Risk Assessments**

Dr. Medhekar has led 200+ process design reviews and hazard/risk assessments using industry-accepted Process Hazard Analysis (PHA) methods, including Hazard and Operability (HAZOP) studies, What-If studies, and Layer of Protection Analysis (LOPA) studies, combined with analytical techniques such as Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Human Reliability Analysis (HRA), Root Cause Analysis (RCA), Consequence Analysis, Transportation Risk Analysis, Safety Integrity Level (SIL) reviews, Alarm management studies, and Quantitative Risk Assessments (QRA). Dr. Medhekar reviews detailed process designs, including process drawings such as Piping and Instrumentation Diagrams (P&ID), Process Flow Diagrams (PFD), Material and Energy Balance (MEB) sheets, 3D Plant model layouts, control-building locations, Instrumentation and Control drawings, etc. Dr. Medhekar has also performed over 20 Site Audits/Project Health, Safety and Environment Reviews (PHSER) during the construction/commissioning stages of various international projects. In this context, he visits project sites, conducts field site walk-downs with Construction and Commissioning personnel, reviews Punch List items, discusses pending project action items, and performs Project Audits via PHSER reviews.

## **System Reliability and Availability and Maintainability**

Using complex Reliability, Availability, and Maintainability (RAM) models, Dr. Medhekar has developed Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR) estimates for complex engineering systems and identified failure modes for various consumer products and industrial equipment.

### **Dr. Medhekar's project work and experience includes:**

- **LNG Liquefaction, LNG Gasification, and NGL Plants.** Dr. Medhekar has worked on several large and mid-scale international LNG Liquefaction plants, multiple domestic LNG Gasification Plants, and a large number of Natural Gas Liquids (NGL) plants. Dr. Medhekar's work includes performance-of-design reviews and risk assessment studies, assessment of potential large losses for insurance coverage, and International Arbitration/Litigation support.
- **Oil & Gas/Refinery and Refinery Expansion Projects.** Dr. Medhekar has worked 25+ Oil and Gas, Refinery, and Refinery Expansion projects in Kuwait, the UAE, Oman, South Korea, Egypt, Japan, Thailand, Qatar, Taiwan, and the USA. Dr. Medhekar's involvement entailed direct on-site project work with EPC clients during the design, construction, and commissioning phases. His

involvement also included design review as well as various Risk Assessment studies, including HAZOP, LOPA, QRA, RAM, and SIL studies.

- **Crude Oil Production, Pipeline Projects, Tank Farm Projects, and OSBL Projects.** Dr. Medhekar has worked on several wellhead projects, offshore platform projects, Crude and Gas storage facilities, and large tank farm and pipeline projects, as well as OSBL (Outside Battery Limits) projects and vendor packages for Surge Separators, Chemical Dosing Packages, Water Knockout Tanks/stock tanks, Desalter Heaters, Transfer Pumps, Brackish Water Tanks and Pumps, Remotely Operated Vehicles (ROV) on Crude and Gas Lines, Pressurized Drains Vessels, and Sampling Cooler and Purge Gas Connections to Flare Headers.
- **Water Treatment and Waste Heat Recovery Projects.** Dr. Medhekar has worked on several water and water treatment projects, including waste water treatment, water reclamation, Ultrafiltration, Reverse Osmosis (RO) systems, Produced Water Treatment Packages Chemical Injection, Ultra filtration Vendor Packages, Water Filtration Grit/Sludge/Backwash, Corrugated Plate Interceptor (CPI) separators, chemical injection vendor packages, Oily Water Sludge (OWS) treatment and lift stations, Effluent Water Treatment, Sanitary Waste water treatment, Utilities and Offsite (U&O) units, Sour Water Systems (SWS), Heat Recovery Unit (HRU) Projects, Incinerators/Waste Heat recovery projects, and Heat Recovery Unit (HRU) Projects.
- **RMP/PSM Projects.** Dr. Medhekar has worked with City/County Fire Departments and Local Emergency Response Providers to perform various Risk Management and Prevention programs (Hazard Assessment, Dispersion analysis) for several Chemical/Petrochemical Manufacturing facilities. He has provided lead technical contributions to more than 20 Risk Management Programs (RMP) and Process Safety Management (PSM) programs for major oil refineries and chemical plants.
- **Dispersion Analysis of Hazardous Gas Releases.** Dr. Medhekar has performed vapor cloud dispersion analysis for various chemicals, including Hydrogen Sulfide (H<sub>2</sub>S), Chlorine (Cl<sub>2</sub>), Ammonia (NH<sub>3</sub>), Sulfur dioxide (SO<sub>2</sub>), Hydrogen Fluoride (HF), LNG, Liquefied Petroleum Gas (LPG), etc. He has performed dispersion analysis for source terms from process facilities, various modes of transportation (including rail and truck), and storage facilities. Dr. Medhekar is familiar with Environmental Protection Agency (EPA)-approved dispersion codes and commercial proprietary codes such as PHAST, ALOHA, CAMEO, AERMOD, and DEGADIS. Dr. Medhekar's work includes: characterizing the source term (vapor/liquid/aerosol release) and calculating the release rate (vapor, pool boiling, etc.); identifying the appropriate dispersion model (Neutrally buoyant or Dense Gas) and identifying the Levels of Concern (Exposure-Response Probability (ERPG)-1, ERPG-2 or ERPG-3); utilizing Local Meteorological conditions and data (wind speed and stability class); plotting Isoleths for concentrations of concern on site maps (as a function of time, using appropriate time averaging); plotting Hazard Footprints for given release scenarios and plotting Risk Contours for the release scenario/facility; and identifying the local demographics at risk for potential releases and communicating the vapor release and dispersion risk to regulators, plant managers, and legal counsel.
- **Automotive Projects.** Dr. Medhekar has performed numerous assessments and reviews for Automotive Systems, including Drive Units, Fuel Systems, Airbag Systems, Safety Restraint Systems (SRS), Electric Vehicle Battery Systems, Hydrogen (H<sub>2</sub>)-based Fuel Cells, and Autonomous Vehicle Drive Systems.
- **Utility and Power Plant Projects.** Dr. Medhekar has performed various reliability studies, safety studies, risk assessments, and design reviews for various utilities and Power Plants in California and New York. Dr. Medhekar has also performed root cause investigations for start-up related Gas Turbine failures and design reviews of Waste Heat Recovery Units (WHRU).

- **Consumer Products & Biomedical Devices.** Dr. Medhekar has performed numerous Failure Modes and Effects Analysis (FMEA) and reliability/risk assessments for various consumer products and biomedical devices for the proactive mitigation of potential product failures.
- **Nuclear Projects.** During his prior tenure at PLG, Inc., Dr. Medhekar was involved in the performance of Probabilistic Risk Assessments (PRA) for five Nuclear Plants in the USA which included Loss of coolant accidents (Level 1), Containment source term quantification (Level 2), and Dispersion modeling of radioactive materials in the air (Level 3).

Prior to joining Exponent, Dr. Medhekar held a variety of consulting and engineering positions with companies including PLG, Inc. in Newport Beach, California; the Center for Risk Studies and Safety in Santa Barbara, California; Indian Oil Refinery in Baroda, India; and Union Carbide in Thane, India.

## Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of California, Santa Barbara, 1991

M.S., Chemical Engineering, University of California, Santa Barbara, 1988

B.Tech., Chemical Engineering, Indian Institute of Technology, New Delhi, 1984

Outstanding Achievement Award, PLG, Inc.

UC Regents Scholarship

Tata Endowment Scholarship

Aryabhata Science Talent Award

Ramanujam Math Talent Award

Best Paper Award, Society of Plastics Engineers, Inc.

## Licenses and Certifications

Professional Engineer Chemical, California, #6087

Certified Functional Safety Expert (CFSE)

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER)

ASQ Certified Reliability Engineer (CRE)

## Professional Affiliations

American Institute of Chemical Engineers (member)

Southern California Society for Risk Analysis (Councilor)

Computational Project, NSF Supercomputer, San Diego, California (Principal Investigator)

Graduate Student Association, UCSB (Administrative Vice President)

Chemical Engineering Society, IIT, New Delhi, India (President)

## Publications

Medhekar, S.R. Safety Instrumented Systems for Process Safety. Chemistry, Process Design, and Safety for the Nitration Industry. ACS Symposium Series, American Chemical Society. Washington, DC, 2013.

2Roy, C., Fessler, J., & Medhekar, S.R. Managing post-production change, materials and processes for medical devices conference. St. Paul, MN, August 25-27, 2004.

Medhekar, S.R., Caligiuri, R.D., & Moalli, J. Practical risk analysis as a tool for minimizing plastic product failures. Proceedings, Society of Plastics Engineers, ANTEC 2000.

Medhekar, S.R., Bley, D.C., & Gekler, W.C. Frequency estimates for transport-related hydrofluoric and sulfuric acid release scenarios. Process Safety Progress, 1993; 12(3), July.

Medhekar, S.R., Bley, D.C., & Gekler, W.C. Prediction of vessel and piping failure rates in chemical process plants using the Thomas Model. Process Safety Progress, 1993; 12(2), April.

Medhekar, S.R., Amarasooriya, W.H., & Theofanous, T.G. Integrated analysis of steam explosions. Proceedings, 4th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, pp. 319-326. Karlsruhe, Germany, October 10-13, 1989.

Medhekar, S.R., Abolfadl, M.A., & Theofanous, T.G. Triggering and propagation of steam explosions. Proceedings, 25th ASME/AICHE National Heat Transfer Conference, pp. 244-251. Houston, TX, July 24-27, 1988.

## Presentations

Medhekar, S.R. & Arora, A. "Neptune PHA Recommendations for H2 Bus." Presentation to Gillig Board, November 2024.

Medhekar, S.R. "Investigation of the MFM Pipe Failure." Presentation to Sewer Authority Mid Coastline (SAM) Board, 28, August 2023.

Medhekar, S.R. OCA Review: "Modelling of Pesticide Releases." Confidential client, August 2023.

Medhekar, S.R. Summary of Opinions, "Monte Carlo simulations for Remedial Costs and Schedule delays." Confidential client, July 2022.

15Medhekar, S.R. Summary of Opinions, "Safety interlocks and Incorrect Plant Startup." Confidential client, October 2021.

14Medhekar, S.R. "Delay Analysis for impacted schedule: Mechanical Completion and Initial Acceptance for a major EPC project." Confidential client, February 2020.

13Medhekar, S. R. "Process Design Review of Wastewater Treatment: Plant, Mediation meeting." Confidential client, January 2020.

12Sorini, A., Stephan, J., Davis, B., Schrauth, A.J., & Medhekar, S.R. "Attabotics Reliability, System Evaluation and FMEA." December 22, 2021.

11Hudgins, A. & Medhekar, S.R. "Assessing the Effectiveness of Covered Conductors and their role in Risk Reduction." FMEA/PHA workshop for SCE, October 21, 2021.

10Medhekar, S.R. "EPA-AMPAC mediation meeting." August 20, 2021.

Medhekar, S.R & Morris, J. "Offsite Consequence Analysis (OCA) Peer Review & Independent

Evaluation." County of San Benito, CA, October 6, 2020.

Sharma, V. & Medhekar, S.R. "Fire damage assessment & Risk Review." Titan Reclamation, July 17, 2019.

Medhekar, S.R. & Hart, R. "Estimated Maximum Loss (EML) and Probable Maximum Loss (PML) for Cheniere Energy: CCLNG and SPLNG sites." Houston, TX, January 21, 2019.

Medhekar, S.R. "HAZOP Leader Training course." Multiple training courses for 100+ HAZOP leaders in various locations within the USA and Asia, 2011-2014.

Medhekar, S.R. "Safety Instrumented Systems for Process Safety." Spring ACS Meeting, San Diego, CA, March 25-29, 2012.

Medhekar, S.R. & Caliguiri, R. "Complex reliability investigations." Lyondell 2005 Worldwide Reliability Forum, Channelview, TX, February 28-March 2, 2005.

Medhekar, S.R. "MEMS reliability — Issues and characterization." Microelectronics Reliability and Qualification Workshop, December 3, 2002.

Medhekar, S.R. & Roy, C. "High pressure fab-tools: Identifying and managing risks." High Pressure Workshop, Austin, TX, October 16, 2002.

Medhekar, S.R. & Lormon, J. "Identifying and managing risk under OSHA and the Clean Air Act." Presented at Ridgehaven Conference Center, Sponsored by City of San Diego Department of Environmental Services, San Diego Unified Port District, County of San Diego, Dept of Environmental Health, San Diego, CA, May 3, 2002.

Medhekar, S.R. "Chemical and petrochemical facilities risk assessment." UCI Extension Course, Irvine, CA, May 13, 1996.

Medhekar, S.R., Marston, T., Gekler, W.C., & Kenyon, R. "Improving refinery operation with a Tenets of Operation program." American Institute of Chemical Engineers, 25th One-Day Meeting, Anaheim, CA, April 30, 1996.

Medhekar, S.R., Kim, Y., & Dykes, R.A. "PSM Seminar." Presented to Pohang Steel and Iron Company, Seoul, Korea, March 5, 1996.

Medhekar, S.R. & Gekler, W.C. "Risk-based pipeline rehabilitation and maintenance projects." Presented to Pipeline Regulatory Compliance Group, Bakersfield, CA, September 14, 1995.

Medhekar, S.R., Dykes, R.A., Landman, R.A., & Lopez, C. "Afloat preposition ship lighting preliminary hazards analysis." 13th International System Safety Society Conference, San Jose, CA, July 14, 1995.

1Medhekar, S.R. & Hou, H.M. "HAZOP leader training for process hazard analysis." Kaohsiung, Taiwan, April 17-19, 1995.

1Medhekar, S.R. "Risk-based pipeline rehabilitation and maintenance projects." AICHE 24th One Day Technical Meeting, Anaheim, CA, November 9, 1994.

Mikschl, T.J., Medhekar, S.R., & Roy, C.M. "RISKMAN and QCRR software training seminar." Presented to Korea Gas Corporation, Seoul, Korea, August 16-19, 1994.

1Medhekar, S.R. "Risk-based technical specifications at South Texas Project, Insights for future applications." Presented to Korea Atomic Energy Research Institute, Seoul, Korea, August 1994.

Medhekar, S.R. & Gekler, W.C. "Fault Tree analysis." Presented to Unocal Corporation, Los Angeles, CA, June 30, 1994.

Medhekar, S.R., Kindinger, J.P., & MacFarlane, D.R. "Source term analysis for high level waste storage accidents." PSAM II, San Diego, CA, March 20-25, 1994.

Medhekar, S.R. & Gekler W.C. "Chemical process risk assessment." PSAM II Short Course, San Diego, CA, March 20-25, 1994.

Medhekar, S.R. & Moncarz, P. "Decision analysis for planning, development, and siting of petrochemical facilities." Presented to Menlo Park, CA, September 17, 1993.

Medhekar, S.R., Smith, M.J., & Gekler, W.C. "MMM Sakhalin project offshore pipeline configuration selection preliminary risk assessment." Presented to MMM Project Team, Houston, TX, June 15, 1992.

Medhekar, S.R. & Kaplan, S. "Bayesian uncertainty analysis for finite populations." Society for Risk Analysis 1991 Annual Meeting, Baltimore, MD, December 8-11, 1991.

Medhekar, S.R., Amarasooriya, W.H., Saito, M., & Theofanous, T.G. "Steam explosions: a transient three fluid model." International Colloquium on the Dynamics of Explosions and Reactive Systems, MI, July 23-28, 1989.

## Reports

Root cause evaluations of an Acid Plant Fire at Smelter facility. Incident Investigation Report for confidential client, February 2025 (contributing author).

Medhekar, S.R. & Arora, A. Preliminary Hazard Analysis (PHA) Study for Gillig, LLC H2 Bus. November 2024.

Medhekar, S.R. & Hart, R. Insurance Risk Assessment Report for Confidential LNG Liquefaction Terminal Client. February 2025.

System vulnerabilities, pipeline failure risks, evaluation of large transmission pipeline outages and mitigation options. Resiliency Risk Assessment for confidential client, October 2024 (contributing author).

Medhekar, S.R. & Reding, N. Combustible Dust Hazard and Gap Analysis for Spray Tower. Confidential client, November 2023.

Medhekar, S.R. Evaluation of the Montara Force Main Failure for Sewer Authority Mid-Coastside. July 2023.

Medhekar, S.R. & Hart, R. Sabine Pass LNG Terminal Insurance Risk Assessment. February 15, 2022.

Medhekar, S.R. & Hart, R. Corpus Christi LNG Terminal Insurance Risk Assessment. February 1, 2021.

Medhekar, S.R. Trical Risk Management Plan (RMP). January 29, 2021.

Medhekar, S.R. & Arora, A. Preliminary Hazard Analysis (PHA) Study for Gillig, LLC Electric Bus. June 2020.

Medhekar, S.R. Noble Additional Compressor Difference HAZOP / PHA. December 2019.

Medhekar, S.R., Arora, A., & Hu, Y. Risk Assessment of Borrego Battery Energy Storage System in Breckenridge, MA. July 2019.

Medhekar, S.R. Egyptian Refining Company SIL Validation Study Report. July 22, 2019.

Medhekar, S.R. Fire Risk Assessment: HEB Bakery Oven. March 26, 2019.

Medhekar, S.R. Root Cause Evaluation of Steam Turbine Damage. Confidential client, April 11, 2018.

Medhekar, S.R. & Arora, A. Battery Pack Manufacturing Process Hazard and Operability Study. May 2018.

Medhekar SR, Commissioning Stage PHSER review, New Water Center project in North Kuwait, prepared for GS Engineering, April 2018.

Medhekar SR, KNPC LPG Train-4 Project Modifications Mina Al-Ahmadi Refinery Kuwait, prepared for Daelim, April 2018

Medhekar SR, HAZOP studies for Units 5, 29, 107, 138, 144, Clean Fuels Project, KNPC, prepared for GS Engineering, April 2018

Medhekar SR, Chilin D, Carnahan R and Gibbs Jonathan, Root Cause Evaluation of Steam Turbine Damage, prepared for a confidential client, April 2018

Medhekar SR and Arora A, Li-Ion Battery Pack Manufacturing Process review, prepared for confidential client, May 2018.

Medhekar SR, Sipe J, Jokar A, Chilin D, Risk Assessment of Indoor Gas Meter Sets, prepared for confidential client, November 2018.

Medhekar SR, Hazard and Operability Study for Unit 150, KNPC's Clean Fuel Projects, prepared for JGC, February 2018.

Medhekar SR, Preliminary Hazards Analysis (PHA) Report for the Installation of Tank and Pump System (TPS) Units at FEMA Sites, prepared for IBTS, September 2017

Medhekar SR, PHSER Stage 4: Construction Stage HSE Review for NWC in North Kuwait, prepared for GS Engineering, August 2017.

Medhekar SR, Custody Transfer Metering System HAZOP, KNPC Clean Fuels Project, prepared for GS Engineering, March 2017.

Chilin D, Medhekar SR. Fire and Gas System Safety Integrity Level (SIL) Verification Study Report for Satah Al Razboot (SARB) Field Development Project - Package 4 EPC Work. Prepared for Hyundai Engineering & Construction, September 21, 2016.

Medhekar SR. Alarm Management and Hazard (AMHAZ) Study for Satah Al Razboot (SARB) Field Development Project - Package 4 EPC Work. Prepared for Hyundai Engineering & Construction, June 27, 2016.

Chilin D, Medhekar SR. Quantitative Risk Assessment (QRA) for KOC Elevated Substations (ESS Project). Prepared for SK Engineering & Construction, June 2016.

Chilin D, Medhekar SR. Safety Integrity Level (SIL) Verification Study Report for HIPPS for Satah Al Razboot (SARB) Field Development Project - Package 4 EPC Work. Prepared for Hyundai Engineering & Construction, May 23, 2016.

Medhekar SR. Pre-Startup & Pre-Commissioning (Stage 5) HSE Reviews for KOC Project - Low Sulfur Fuel Oil (LSFO), Fuel Gas (FG) and Gas Oil Pipelines from Mina Al-Ahmadi to Sabiya and Doha Power

Stations for Kuwait Oil Company (KOC). Prepared for Hyundai Engineering & Construction (HDEC), January 2016.

Chilin D, Medhekar SR. Vendor HAZOP Study of Units 57/97/160/161/275/151/46 for KNPC's Clean Fuels Project (CFP). (Multiple reports) Prepared for SK Engineering & Construction, January 2016.

Chilin D, Medhekar SR. Safety Requirements Specification (SRS) for SKEC MGC Revamp Project. Prepared for SK Engineering & Construction, December 2015.

Chilin D, Medhekar SR. Re-HAZOP Study of Unit 183 for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, December 2015.

Medhekar SR. PHSER Stage 4: Construction Stage Project HSE Review (PHSER) for KOC WARA Pressure Maintenance Project. Prepared for GS Engineering & Construction, October 2015.

Arora A, Medhekar SR, Bak W. Risk Assessment of Tranquility Lithium-ion Energy Storage System. Prepared for PG&E Energy Procurement, September 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Units 129, 141, 150, 166, 175 & 176 Chemical Injection Packages for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, July 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 176 Temperature Control Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, July 2015.

Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 135 Reactor Charge Heater for KNPC's Clean Fuels Project (CFP). Prepared for GS Engineering & Construction, July 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 141 Recycle Gas Compressor Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, July 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 141 Tail Gas Compressor for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, July 2015.

Medhekar SR. Hazard and Operability (HAZOP) Study for Daelim KOC Telemetry Project - AO#5 Project. Prepared for Daelim Engineering & Construction, July 2015.

Medhekar SR. Register of Safety Related Devices for SKEC KOC Elevated Substations (ESS Project). Prepared for SK Engineering & Construction, June 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 141 Atmospheric Fractionator Feed Furnace for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 141 Fractionator Overhead Compressor for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 141 Make-up Hydrogen Compressor for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 163 Re-HAZOP of DS Sump Vessel to Coker Off-Spec Tank for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 171 Instrument Air Dryer Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 171 Nitrogen Separation Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Cho HC, Chilin D, Medhekar SR. Vendor HAZOP Study of Unit 175 Side Steam Filter Package/Unit 171 Water System for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, May 2015.

Medhekar SR. Pre-Startup & Pre-Commissioning (Stage 5) Project HSE Review for SKEC KOC's ESS Project. Prepared for SK Engineering & Construction, May 2015.

Medhekar SR. Vendor HAZOP Study of Unit 141 Feed Filter Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Medhekar SR. Vendor HAZOP Study of Unit 141 H2 Membrane Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Medhekar SR. Vendor HAZOP Study of Unit 141 H2 PSA Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Chilin D, Medhekar SR. Vendor HAZOP Study of Utility Boilers in Unit 129 (Steam System) for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Medhekar SR. Unit 183 Additional HAZOP for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Medhekar SR. Vendor HAZOP Study of Unit 183 Fired Heater Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Medhekar SR. Vendor HAZOP Study of Unit 183 Liquid Ring Compressor Package for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, April 2015.

Chilin D, Medhekar SR. Construction (Stage 4) Project HSE Review for SKEC KOC's ESS Project. Prepared for SK Engineering & Construction, March 2015.

Medhekar SR. Detailed Design HAZOP Study of Unit 141 (ARDS Unit) for KNPC's Clean Fuels Project (CFP). Prepared for JGC Corporation, February 2015.

Medhekar SR. Vendor HAZOP Report for Satah Al Razboot (SARB) Field Development Project - Package 4 EPC Work. Prepared for Hyundai Engineering & Construction, December 2014.

Medhekar SR. EDG Package Hazard and Operability (HAZOP) Study for Daelim KOC Telemetry Project. Prepared for Daelim Engineering & Construction, October 2014.

Chilin D, Medhekar SR. HP/LP Flare Radiation Study for SKEC MGC Revamp Project. Prepared for SK Engineering & Construction, August 2014.

Ruiz L, Chilin D, Medhekar SR. Fire Explosion Risk Assessment (FERA) for SKEC MGC Revamp Project. Prepared for SK Engineering & Construction, August 2014.

Chilin D, Medhekar SR. Vendor Package Safety Integrity Level (SIL) & Layers of Protection Analysis (LOPA) for Satah Al Razboot (SARB) Field Development Project - Package 4 EPC Work. Prepared for Hyundai Engineering & Construction, August 6, 2014.

Medhekar SR. Pre-Startup & Pre-Commissioning (Stage 5) Project HSE Review (PHSER) for KOC WARA Pressure Maintenance Project. Prepared for GS Engineering & Construction, July 2014.

Ruiz L, Chilin D, Medhekar SR. Quantitative Risk Assessment (QRA) for Daelim KOC Telemetry Project - Revision 3. Prepared for Daelim Engineering & Construction, July 2014.

Chilin D, Medhekar SR. Hazard and Operability (HAZOP) and Safety Objective Analysis (SOA) Study for SKEC MGC Revamp Project. Prepared for SK Engineering and Construction, May 2014.

Chilin D, Medhekar SR. Additional Pre-Start-up Hazard and Operability (HAZOP) Study (Part 2) for Daewoo RRE4 Project. Prepared for Daewoo Engineering & Construction, May 2014.

Chilin D, Medhekar SR. Pre-Start-up Hazard and Operability (HAZOP) Study for Daewoo RRE4 Project. Prepared for Daewoo Engineering & Construction, May 2014.

Park HM, Medhekar SR. ENI-Iraq Zubair Oil Field Development Project HAZOP Report - Rafidiyah New DGS - DGS South. Prepared for Daewoo Engineering & Construction, May 11, 2014.

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## Deposition & Trial Testimony

### Arbitration Trial Testimony

ICC Arbitration proceedings in Poland. Baltisse N.V. et al. v. M. Szamborski et al. INTERNATIONAL COURT OF ARBITRATION, INTERNATIONAL CHAMBER OF COMMERCE, ICC Case No. 25831/FS (October 2022). Authored expert reports and testified at the ICC Arbitration trial. Issues related to manufacturing aspects & production technology and EN standards.

UNCITRAL Arbitration (May 2010). UNCITRAL ARBITRATION No. UNC76/AVH, BARRACUDA & CARATINGA LEASING, COMPANY B.V. Claimant, against KELLOGG BROWN & ROOT LLC

Respondent. Authored an expert report and testified at the International Arbitration trial.

### **Litigation Expert Reports**

Affidavit for a confidential client as a Testifying Expert as per American Arbitration Association Construction Arbitration Rules. Dispute between an Owner and EPC contractor regarding process equipment design issues and construction delays. Case settled out of court. December 2022.

Sworn statement as a Testifying Expert under LCIA Arbitration, regarding a "Dispute between Technology Licensor and Plant Owner regarding design of plant blowdown systems" for a confidential client. Case settled out of court. September 2022.

Technical assessments as Testifying Expert for a confidential client. Dispute between Vendor and Refinery Owner regarding Flare design and flare operation related issues. Parties settled out of court. February 2022.

Medhekar, S.R. Engineering Standard of Care for Project Management/Construction activities, Industry Standards and Best Practices and Root Cause Evaluations/Analysis, associated with an underground Pipeline Strike resulting in a large oil spill event. Confidential client, September 16, 2024.

Medhekar, S.R. Online H<sub>2</sub>S detector/analyzer and associated alarms associated with sour gas slug with high H<sub>2</sub>S concentration gas breakthrough event into a large gas pipeline and associated industry standards, reasonable operator practices during alarm conditions and shutdown protocol. Rebuttal Expert Report for confidential client, March 25, 2024.

Medhekar, S.R. Investigation of a Level Control Valve failure/malfunction leading to release of Ammonia gas fumes. Confidential client, May 2024

Medhekar, S.R. H<sub>2</sub>S / SO<sub>2</sub> concentration measurements for regulatory enforcement actions. Confidential client, September 2024.

Medhekar, S.R. Responses to Address Select Sections of EPA Notice of Potential Violations of Section 112(r)(1) of the Clean Air Act associated Relief valve and Rupture disk sizing and venting requirements as per API 520 and 521 standards. Process Review for confidential client, April 23, 2021.

### **Depositions**

Exxon Mobil Corp. v. Doosan Heavy Indus. Canst. Co., Ltd., et al., in the 280th Judicial District Court of Harris County, Texas. Cause No. 2004-18011 (May 2006), Dispute between Refinery owner and EPC contractor. Authored an expert report and provided deposition testimony.

SCAQMD v. SoCal Refineries. Regulatory dispute between Regulators and Southern California Refineries. Authored multiple expert reports and provided deposition testimony (1991) regarding use of HF based alkylation processes and associated risks.