Program Sponsors and Project Leadership

Bob Daniels  
Anadarko  
Executive Vice President, International and Deepwater Exploration

Don MacLiver  
Anadarko  
Vice President, Operations (Mozambique)

Don Vardeman  
Anadarko  
Vice President, Worldwide Project Management

John Peffer  
Anadarko  
Country Manager (Mozambique)

Antonio Sevilla  
Anadarko  
Program Lead

Claire Markwardt  
Markwardt Performance Consulting (MPC)  
Project Team Lead

Dr. Tom Blasingame  
Texas A&M University  
Academic Lead
In an effort to build technical skills and sustainable petroleum capabilities in the country, Anadarko and Mozambican government leaders agreed in 2012 to develop a Master of Science in Petroleum Engineering (MSPE). This 3-year effort at the University of Eduardo Mondlane (UEM) in Maputo will culminate in 2016 when the first group of Mozambican MSPE students graduate from the rigorous petroleum engineering program.

**Program Inception and Accomplishments**

Anadarko and the University of Eduardo Mondlane establish a memorandum of understanding aimed at building a petroleum education program in Mozambique.

2012

University and industry experts develop a Master’s Program.

2012 - 2015

UEM graduates first group of MSPE students.

2016


2013

• Inaugural Core Petroleum Engineering program launches at the University of Eduardo Mondlane as a prerequisite to the Master’s Program.

• MIREM approves $200K of annual contributions from Anadarko and participants in Area 1 to be allocated to the MSPE program for five years.

2014

• Inaugural Master’s Program launches at the University of Eduardo Mondlane.

• Mozambique Society of Petroleum Engineers (SPE) established.

2015

• First group of students complete all petroleum engineering course work.

• The students embark on their petroleum engineering research dissertations.

**Tripartite Relationship**

Academia • Mozambican Government • Industry
The Core Program is a one-year introductory program that presents foundational petroleum engineering concepts to students prior to the start of the more rigorous Master’s Program. The Core Program is a recommended pre-requisite to the Master’s Program.

Students who complete the Core Program or demonstrate appropriate industry experience can apply for the two-year Petroleum Engineering Master’s Program. The Master’s Program is comprised of eight distinct courses, technical and research seminars, and a research dissertation project.

The Dissertation consists of original research on a topic chosen by the students and their advisors. Topics are focused on their value to Mozambique exploration, drilling, production, facilities, and oil and natural gas industry infrastructure.

In addition to the Core and Master’s curriculum, other skill-building opportunities are provided. A math practice course is offered to refresh student’s analytical and computational math skills. Additionally, an English-language program was initiated, and an academic writing class is available for dissertation students to improve English technical writing skills.

“It is very important at this critical time in Mozambique’s development for all stakeholders to work together to build Mozambique’s capacity, to manage the substantial challenges it faces in the coming years, and to ensure the tremendous natural resource wealth this country possesses benefits all its citizens. The launch of the UEM Postgraduate Program in Petroleum Engineering is a significant opportunity to contribute to this capacity building effort.”

John Peffer – Country Manager, Mozambique
Cumulative Three-Year Program

YEAR 1

Core Program
- Production Operations and Facilities Engineering
- Reservoir Engineering and Petrophysics
- Drilling and Completions Systems
- Geoscience for Petroleum Engineers

First Year Master’s

1st Semester
- Phase Behavior
- Advanced Drilling Techniques
- Applied Mathematics of Fluid Flow in Porous Media

YEAR 2

2nd Semester
- Technical Seminars
- Formation Evaluation
- Advanced Production Engineering
- Advanced Reservoir Engineering

YEAR 3

3rd Semester
- Research Seminars
- Reservoir Modeling
- Integrated Reservoir Management

Second Year Master’s

4th Semester
- Dissertation
- Completion

Master’s Research Dissertation

Safety, Ethics, Communication, Business Skills

MS Prerequisites
Geoscience for Petroleum Engineers — Covers basic geoscience concepts, methods and tools used in oil and natural gas exploration and development.

Drilling and Completions Systems — Introduces petroleum engineering, rheology, rotary drilling and well completion practices.

Reservoir Engineering and Petrophysics — Introduces reservoir description techniques and engineering methods related to petroleum reservoirs.

Production Operations and Facilities Engineering — Covers basic production operations and surface processing and treatment facilities.

Applied Mathematics of Fluid Flow in Porous Media — Covers the mathematical techniques to formulate and solve fluid-flow problems in porous media.

Advanced Production Engineering — Provides foundational lessons in production operations and production analysis and troubleshooting procedures.

Phase Behavior — Introduces phase behavior of petroleum fluid change and its impact on reservoir and production performance.

Advanced Reservoir Engineering — Covers the theory and application of advanced pressure-transient analysis techniques.

Advanced Drilling — Expands on the initial drilling course and covers developments in computer processing.

Formation Evaluation — Covers tools and techniques for determining and evaluating petroleum formation properties and data interpretation of data.

Reservoir Modeling — Covers reservoir simulation for integrating geological, geophysical and engineering data to predict future reservoir performance.

Integrated Reservoir Management — Focuses on integrating geological, geophysical and engineering data to predict future reservoir performance and associated uncertainties.
Dissertation

The dissertation system is a comprehensive approach for research and academic report writing. It requires the utilization of five interrelated components for the system to work most efficiently and effectively. These components work together to create an integrated system that supports the dissertation process and the student throughout the program.

1. **Process Guide** – Documentation of all activities necessary to complete a UEM petroleum engineering dissertation.

2. **Administration** – Management of the schedule of actions to be completed each semester.

3. **Supervision** – Advisory meetings for information sharing and research guidance.

4. **Student Skills** – Development of necessary skills including time management, research skills, academic writing and revising, proofreading and editing.

5. **Tools** – Tools and templates for managing, organizing, tracking and writing the dissertation.
Professor Development

The capability building of UEM petroleum engineering professors is essential to supporting long-term program sustainability and vital to producing skilled and employable master’s students.

Professor Development is a three-phase approach focused on deepening content knowledge and experience in the classroom:

**Phase One** – Professors teach some content and co-develop course material with guidance from U.S.-based professors.

**Phase Two** – Professors teach additional content and co-advise dissertations; they begin participation in intensive learning events at the U.S.-based professor’s university.

**Phase Three** – Professors teach all content and advise students through the dissertation process; they analyze and expand on the information through course material revisions.

UEM petroleum engineering professors are also provided with learning opportunities to enhance understanding of the petroleum industry. These opportunities include one-on-one learning sessions with U.S.-based professors on subject content; observation of U.S. dissertation defenses; visits to industry sites, such as Schlumberger’s test facility in Rosharon, Texas, and the Halliburton Technical Center; attendance at the Society of Petroleum Engineers (SPE) annual technical conference; and, museum visits such as the Ocean Star Drilling Museum in Galveston to provide the context of the course content to industry.

Drilling and Completions Systems instructor, Dr. Rui Sitoe, experienced learning events with Texas Tech University petroleum engineering professor, Dr. Lloyd Heinze. Dr. Sitoe visited Chevron’s equipment training facility and viewed drilling rigs at the Permian Basin Petroleum Museum (pictured at left) in Midland, Texas. These site visits helped Dr. Sitoe enhance his understanding of the drilling course concepts.
Course Development

Course development is achieved through collaboration with Anadarko subject-matter experts, U.S.-based and UEM professors and instructional designers.

Using this approach, industry representatives and U.S.-based petroleum engineering professors provide technical material, which is then structured into course content by an instructional designer. Finally, the course content is reviewed by a UEM professor for local relevance.

This course development method creates repeatable learning experiences and enhances UEM professor understanding of petroleum engineering topics. The engagement of the UEM professor during development is essential to building a sustainable curriculum.
The majority of students entering the MSPE program have acquired technical backgrounds in engineering, geology or natural science; therefore, the students possess many of the fundamentals required for a master’s degree. Through a combination of coursework, research, industry support and Society of Petroleum Engineers (SPE) involvement, and graduate advising, these technical students develop into capable and employable petroleum engineers.
Continuum of Support

Long-term sustainability has been the primary focus throughout the development of the MSPE at UEM. Therefore, fundamental elements which support the viability and future growth of the program are embedded into the foundation of the Master’s Program. These include committed UEM leadership, dedicated faculty, capable students, “fit for purpose” curriculum and reliable technical infrastructure.

As the program transitions to UEM, focus on these sustainability elements will be vital to the success of the program. Although establishment of the MSPE program was part of the corporate responsibility goals set forth by Anadarko and the participants in Area 1, the program requires long-term support to ensure industry relevance and program growth. Dedicated partners are necessary to advise, promote and actively support UEM in providing premier petroleum education and contributing meaningfully to the industry of Mozambique and Sub-Saharan Africa.

Opportunities for future involvement could include:

- Master’s course delivery support
- Research guidance and dissertation advising
- Professor development
- Labs and classrooms
- Software and other program materials
- Internships
- Field experiences
Long-term support includes:

• Providing advice and expertise regarding the curriculum and research activities of the MSPE and other UEM petroleum programs

• Providing assistance in developing and strengthening UEM petroleum engineering’s resources – financial, human and infrastructure

• Facilitating industry integration and encouraging communication between the program and industry (operators, oil field service companies, etc.)

Industry commitment to UEM petroleum programs is essential to maximizing the capabilities of graduates. Through partnership with UEM, petroleum companies can best utilize the programs to develop industry knowledge and to establish a pipeline of talent for the industry for many years to come.
Program Contacts

**Industry Inquiries**

Antonio Sevilla  
anthonio.sevilla@anadarko.com

**Program Leadership**

Dr. Luis Lucas  
Deputy Dean for Post-Graduate Studies  
luis.lucas@uemep.uem.mz

Dr. Rui Sitoe  
PE Course Director  
rui.sitoe@uemep.uem.mz

**Prospective Students**

Rodrigues Mondlane  
rodrigues.mondlane@uemep.uem.mz