INTRODUCING THE LARGEST SINGLE OIL FIELD (GREATER ANETH, SOUTHEASTERN UTAH) COLLECTION OF CARBONATE CORES IN THE ROCKY MOUNTAINS—TOOLS FOR EDUCATION AND RESEARCH

The Utah Core Research Center (UCRC) has added to its inventory a significant collection of carbonate cores (as well as related data) taken from wells in Utah's largest oil field. Greater Aneth, in the Paradox Basin. Greater Aneth has produced over 483 million barrels of oil and 441 billion cubic feet of gas from the shallow marine Pennsylvanian (Desmoinesian) Paradox Formation. Limestones and finely crystalline dolomite reservoir rocks are sealed by organic-rich, overlying and underlying shale beds, that are also the source of hydrocarbons in this enormous stratigraphic trap.

The new collection consists of cores from 127 wells totaling about 7.4 km (4.6 mi). These cores display a wide variety of characteristics that are critical for understanding carbonate rocks—lithofacies, diageneric events, petrophysical properties, and sequence stratigraphy (flooding surfaces, stacking patterns, cyclicities, system tracts). The Aneth cores reveal complex fracture patterns of carbonate rocks consisting of (1) collinear, parotial, and skeletal grainstone and packstone, (2) phylloid-algal bafflestone, (3) microbial boundstone, (4) thick anhydrites along the field margins, (5) dolomitized packages of chaotic carbonate rubble, and (6) deeper water, cross-bedding, and allochemical grainstone, (2) phylloid-algal bafflestone, (3) microbial boundstone, (4) thick anhydrites along the field margins, (5) dolomitized packages of chaotic carbonate rubble, and (6) deeper water, cross-bedding, and allochemical grainstone. These lithofacies are the products of diverse depositional environments including shallow-marine beach and shoal, algal mound, low-energy restricted shelf, slope detrital aprons and fans, open-marine shelf, etc. that produce significant heterogeneity within the Aneth cores. Fractures are relatively common and there is evidence (i.e., hydrothermal dolomite, stylolite swarms, and local brecciation) of minor but important faults that may affect fluid flow. Porosity includes interparticle, shelter, interparticle, vug, and intercrystalline pores, often enhanced by fractures. The original carbonate fabrics are commonly overprinted by dolomitization, early marine cementation, dissolution, and late, post-burial compaction and calcite or anhydrite filling.

The Aneth core collection is now permanently preserved and publicly available at the UCRC for detailed studies and projects. It is of world class significance and offers an unparalleled opportunity for the study of the carbonate facies that are common in the Paradox Basin. The cores are currently being examined and described by students, professors, and research organizations, as well as oil companies. The carbonate characteristics of the Paradox Formation observed in the Aneth cores are providing outstanding teaching tools for geology students.
The Greater Aneth Core Collection
• Cores from 64 wells prior to 2016
• Cores from 127 wells donated by Resolute Energy Corporation, Denver, Colorado
• Core collection now consists of 43% of all wells in the field
• Cuttings from 584 wells
• Additional Aneth materials available for study:
  - thin sections
  - core analysis (porosity & permeability)
  - core descriptions
  - company reports
• Recent M.S. theses from the Department of Geological Sciences, Brigham Young University
  • “Lithofacies and Sequence Architecture of the Upper Desert Creek Sequence (Middle Pennsylvanian, Paradox Formation) in the Greater Aneth Field, Southern Paradox Basin, Utah” by Evan Gunnell
  • “Lithofacies and Sequence Architecture of the Lower Desert Creek Sequence (Middle Pennsylvanian, Paradox Formation) in the Greater Aneth Field, Southern Paradox Basin, Utah” by Chasse Rinderknecht

Learning Objectives
• By completing this workshop, you will be able to:
  1. Better understand the complexities of carbonate rock systems
  2. Learn about the various methods used to study and interpret carbonates
  3. Gain insight into the geological processes that have shaped carbonate reservoirs

Resources
• Reservoir modeling for enhanced oil recovery
• Carbon capture and sequestration
• Core and cuttings from the UCR collection
• Geophysical properties/rock mechanics

Credit: Peter Nielsen, P.G., peternielsen@utah.gov
Assistant Curator: Thomas Dempster, thomasdempster@utah.gov

Acknowledgments
Core and stratigraphic descriptions shown in this presentation were
published by the Utah Geological Survey, which is supported by the U.S. Department of Energy through the National Energy Technology Laboratory (NETL) and the Utah Department of Natural Resources. The following organizations contributed funds to the new collection of cores from Paradox Corporation:
  • Resolute Energy Corporation
  • Utah Geological Association
  • Rocky Mountain Section of the American Association of Petrolem Geologists
  • Rocky Mountain Section Foundation of the American Association of Petroleum Geologists

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The Greater Aneth Core Collection
Location of cores in Greater Aneth field now available at the Utah Core Research Center

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Well with Available Core and Cuttings
Wells with Available Core and Cuttings

Opportunities for Research and Teaching with Carbonate Rocks in Greater Aneth Core—and We’ve Only Scratched the Surface Subsurface!

Facies*

Diagenesis*

Reservoir modeling for enhanced oil recovery/Carbon capture and Sequestration

Petrophysical Properties/Rock Mechanics*

Sequence Stratigraphy

RESOURCES

**注: Chibber and Eby (2014) for additional examples, detailed core descriptions, etc., from the northwest part (Athen Unit) of Greater Aneth Field

REFERENCES


Utah Core Research Center
• 380 N. Washington St., 84103 Salt Lake City, UT 84103
• 8:00 am to 5:00 pm, Monday-Friday
• geology.utah.gov