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Controlled Freeze Zone™ Technology for Enabling Processing of High CO₂ and H₂S Gas Reserves

J.A. Valencia, P.S. Northrop, and C.J. Mart / ExxonMobil Upstream Research Company

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Abstract

Controlled Freeze Zone™ is a technology for the single step separation of CO₂ and H₂S from natural gas. The economic commercialization of natural gas fields with high CO₂ and H₂S content in an environmentally sound fashion is enabled by the Controlled Freeze Zone™ technology since it greatly facilitates the geosequestration of CO₂ and other acid gases. Developed by ExxonMobil Upstream Research Company, CFZ™ is being brought to commercial-readiness in a commercial demonstration plant being built in Wyoming, USA.

Introduction

Global natural gas reserves and new resource opportunities are increasingly reported with significant CO₂ and/or H₂S content. Concentrations of 20 to 40% are not uncommon, and in some cases they even exceed 50% of the full wellstream. Commercialization of such resources poses significant economic and technical challenges. As illustrated in Figure 1, roughly one-sixth of ExxonMobil *overall hydrocarbon resources*, on an oil-equivalent barrel basis, are categorized as sour gas. With these volumes, ExxonMobil has the industry's largest sour gas resource base and has extensive (over fifty years') experience in managing sour gas. From an industry perspective, likely one-fifth to one-third of all *natural gas resources* in the world would be similarly classified as sour gas.

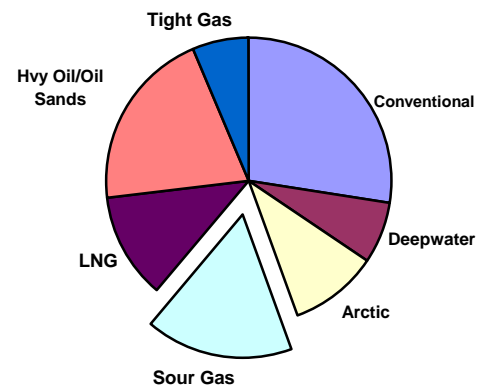


Figure 1. ExxonMobil Total Resource Base

Monetization of lesser amounts of saleable methane/ hydrocarbons while at the same time producing, removing and disposing of major quantities of acid gas contaminants calls for technologies that can substantially reduce capital and operating costs to enable the economic viability of such undertakings.

The proper disposal of these contaminants adds to the challenge. Release of CO₂ to the environment is not desirable, its geosequestration being a much better alternative, and better yet if it can be turned into a product stream to be sold or used for enhanced oil recovery purposes. Similarly, alternatives for the disposal of H₂S are needed, as the conventional conversion to elemental sulfur led to the saturation of many markets. While there has been a recent resurgence in the demand for sulfur, particularly in high growth areas in the world, questions about widespread geographical demand sustainability prompt for the availability of more H₂S disposal options than just sulfur production.

The CFZ™ technology, developed at ExxonMobil Upstream Research Company, is being advanced to the commercially-ready stage in response to these needs.