Simulation and energy consumption assessment of flue gas separation for carbon dioxide and nitrogen recovery

S. Huachao¹, Z. Qiao*¹

¹School of Chemical Engineering and Technology, Xi’an Jiaotong University, China

Abstract

Fossil fuel combustion is the major source of carbon dioxide, and such situation can not be changed at least in the next several decades. Due to the influence of greenhouse effect, global warming trend is unavoidable, so carbon dioxide capture and emission reduction is becoming a hot research topic in recent years. Carbon Capture and Storage (CCS) has been developed and a lot of related literature has been published. In China, coal is the main energy supplier, especially in electricity generation. Fossil fuel power plants consume more than 85% nitrogen, approximately 15% of carbon dioxide, and some other pollutants, such as sulfur oxides, dust, etc., so carbon capture is needed before emission. Conversely, the carbon dioxide and nitrogen are the raw materials to synthesize urea. To this end, major research focus in recent years has been in high temperature coal gasification, solid oxide electrolysis cell, and full-scale demonstration. This paper presents a separation process of carbon dioxide and nitrogen in coal fired power plants. The simulation results show that the recovery and reuse of carbon dioxide and nitrogen can not only reduce greenhouse gas emission, but also reduce the cost of carbon capture. The process in this paper could act as a flue gas purification treatment unit, and also be used as the raw material to synthesize carbon dioxide production units. Therefore, this method is of great significance to emission reduction, energy conservation and cost reduction.