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RPC Exhaust gas recovery by open loop method

RPC detectors require to be flushed with small but continuous flow of gas mixture. Dealing with large number of detectors, the gas consumption adds up to large volumes. Gas flow is a running expense and constituent gases are too expensive to be treated as consumables. Exhaust gas mixture from detectors is a potential hazard if discharged directly into the atmosphere. Storage of gases on a large scale also leads to inventory and safety related problems.

A solution to these problems is the recovery and reuse of exhausted gas mixture from RPC detectors. Close loop method employs recirculation of exhausted gas mixture after purification, analysis and addition of top-up quantities. In open loop method, under consideration here, individual component gases are separated from gas mixture and reused at source. During open loop process, gases liquifiable at low pressures are separated from ones liquifiable at high pressure. The gas components within each group are successively separated by either fractional condensation or gravity separation.

Gas mixture coming from RPC exhaust is first dessicated by passage through molecular sieve adsorbent type (3A + 4A). Subsequent scrubbing over basic activated alumina removes toxic and acidic contaminants such as S₂F₁₀ produced during corona (arc)ing discharge. In the first stage of separation, Isobutane and Freon are concentrated by diffusion and liquified by fractional condensation by cooling to -30 degrees centigrade. Liquified gases are returned to source tanks.

In the second stage of separation, Argon and Sulphur hexaflouride, the residual gases, are concentrated by settling due to density difference. SF₆ is stored for recovery by condensation at high pressure while Argon is further purified by thermal cracking of crossover impurities at 1000 degrees centigrade followed by wet scrubbing.

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