I. INTRODUCTION

Erosion and corrosion problems in oil and gas production cost the petroleum industry hundreds of millions of dollars each year. Severe damage has occurred to tubing, flow lines, pipe fittings, headers, valves, pumps, and other production equipment. Erosion/corrosion problems are associated with production velocities. Erosion is most severe when production velocities are high. Erosion-corrosion problems of deep pitting occur at intermediate flow velocity ranges.

To date, the most effective countermeasures involve using special erosion/corrosion-resistant materials, inhibitors, coatings, or placing limitations on production and flow velocities. These solutions can be very costly, and considerable work has been directed toward helping producers control the costs and lost production associated with erosion/corrosion damage. However, only limited work has been directed toward understanding the effects of flow velocity and flow geometry on the removal of metal by erosion/corrosion.

Oil and gas companies seek design and operating guidelines that will allow them to economically maximize production rates. Current guidelines are based on a recommended "erosional velocity" limitation described by The American Petroleum Institute Recommended Practice 14E (API RP 14E), which does not recognize many of the important factors contributing to erosion and corrosion damage. For example, the RP 14E guideline does not account for solid particles contained in the flow (such as sand), corrosivity of the fluid, type and concentration of inhibitors used, formation and removal of corrosion scale, type of metal used in equipment or geometries of production equipment.

The overall goal of this research is to generalize the "threshold velocity" concept embodied in RP 14E to account for these additional factors. To achieve this goal, experimental data relating the erosion, corrosion, and erosion-corrosion damage to flow velocity and to the other key factors are needed. Computational models are needed to guide the experiments and to extend the experimental results. To date, results from experiments and modeling have been combined to develop procedures and user-friendly computer programs for sand erosion to generalize API RP 14E. The program is called SPPS for Sand Production Pipe Saver. User-friendly computer programs have also been developed for CO₂ corrosion (SPPS:CO₂) and erosion-corrosion (SPPS:E-C). Currently we are expanding the capabilities of these programs.

The following chapters contain background information on the Erosion/Corrosion Research Center, the benefits of the program, research goals, and a description of the research done since the last meeting.