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CONTROL OF AN HYDROGEN REFORMER WITH OUTPUT FEEDBACK: AN LMI APPROACH

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Abstract. *This paper studies the application of a controller design method by output feedback in the presence of symmetrically bounded control based on Linear Matrix Inequalities (LMI) to an hydrogen reformer. This process is used in petrochemical plants that produces hydrogen from hydrocarbons. The design method which is recently developed is applied with success despite the presence of severe asymmetric constraints on the control while other methods fail due to the particular form of the obtained state space representation.*
keywords: Constrained control, Asymmetric constraints, Hydrogen reformer

1. **Introduction.** It is well known that the problem of actuator saturation is inherent to all dynamical systems. This main problem has been an active area of research, even for linear systems, for many years. Two main approaches have been developed in the literature: The first, the so-called positive invariance approach (see [2], [3], [11], [19], [13], [9] and the references therein) is based on the design of controllers that work inside a region of linear behavior and do not allow saturation to be reached. An extension of this approach to a class of hybrid systems can be found in [12], [5]. For the second approach however, the actuator saturations are allowed and the goal to achieve is the asymptotic stability despite the existence of actuator saturations (see [17]- [18], [10] and the references therein). The main objective of these two approaches is to obtain a domain of initial states as large as possible such that asymptotic stability is achieved despite the presence of saturations [15], [2], [17], [6], [1].

The problem of stabilizing linear systems by output feedback, despite its apparent simplicity, is still open. A number of numerical procedures have been proposed for solving the problem since the work of Kimura [16]. A survey was given by [23], and recent progress has been made for the related problem of pole placement; see [13], [14], and the references therein. However, less works were proposed for linear systems with actuator saturations.

This paper applies the results of [8] to the Hydrogen Reformer system which admits a state space model with particular matrix B not suitable to use with other methods