Ph. D. Thesis (Tcheutchoua Fossi Omer Donat)

Title: SIEVING DEVICES BASED ON NONLINEAR DYNAMICS OF ELECTROMECHANICAL SYSTEMS WITH ROTARY ELECTRIC ACTUATOR: THEORY AND EXPERIMENT.

Abstract

This thesis deals with the nonlinear dynamics in electromechanical systems with rotary electric motors in order to design a home sieving device and an industrial sieving device. After the schematic representation and the description of each prototype, the mathematical models are written and appropriate theoretical and experimental methods are used to investigate their dynamical behaviors. The following main results are obtained.

- Their dynamical behaviors show common nonlinear phenomena such as jump, period-nT oscillations, quasi-periodic and chaotic motions.
- Depending of their parameters values, each device can operate either in the regular states or in the chaotic states during its functioning.
- Intermittent Power Supply Feedback Control (IPSFC) and Field Oriented Control (FOC) associate to Time Delay Feedback Control (TDFC) are used to generate desired complex phenomena such as period-nT oscillations and chaotic motions in the home sieving device and industrial sieving device respectively.

➢ For the home sieving device, good agreements are found between the results from the analytical treatment and the ones from the numerical simulations.

➢ Results from experimental set-up of industrial sieving device showing period-nT oscillations and chaotic motions are qualitatively comparable to the ones obtained by computer simulations.

Keywords: Electromechanical systems, Rotary electric motors, nonlinear dynamics, anti-control of chaos, home sieving device, industrial sieving device.