ONLINE MODEL BASED CONTROL
FOR TWO TANKS BY VIRTUAL INSTRUMENTS

INTRODUCTION

In many chemical industries, there is an increasing trend to place a consideration on the production of high value products or treatment water with automatic control. The control of liquid level and temperature in the tanks are basic problem in the process industries. The process industries require liquids to be pumped, stored in the tanks, and then pumped to another tank. Often the tanks are so coupled together such as pre-heated crude oil process that the levels interact and this must also be controlled. Many times the liquids will be controlled by chemical or mixing treatment in the tanks, but always the level of fluid in the tanks must be controlled, and the flow between tanks must be regulated. Level and temperature control in tanks are at the heart of all chemical engineering systems. But chemical engineering systems are also at the heart of economies. The typical industries where liquid level and temperature control are essential include:

- Petro-chemical industries
- Paper making industries
- Water treatment industries

The interacting tank process is designed for the research and development of process control principles, which require the accuracy control and consistency for most processes. As a challenge main unit in such processes, the interacting tank process is generally involved in manufacture of these products not only these process can be a single-input single-output (SISO) process but also it can be a multiple-input multiple-output (MIMO) process.

The study of interacting tank offers many challenges. Firstly, interacting tank process is a special suitable case to study. Secondly, to study controller design, the interacting tank process is controlled by the several designed controllers, proportional

integral derivative (PID), internal model control (IMC), generic model control (GMC) and fuzzy logic control (FLC) controller, which they can adapt the response to the new set point in a few time and have a high accuracy. Finally, to control the dynamic process at any place, the interacting tank process is controlled on web-based.

Tank level control systems are popular used. All of our process industries, the human body and fluid handling systems depend upon tank level control systems. It is essential for control system engineers to understand how tank control systems work and how the level control problem is solved. As interacting tank process is used in many industries, it is known that this process involves with non-linear system. As a result, there is a great deal of interest in making the choices to control to achieve the good response while minimizing the time of adapting. This work provides a controller for investigating the different control strategies. For this purpose, it is desirable to control the interacting tank process during its operation in order to obtain the good response and safe the time for adapting. A control system is an essential part to ensure that the desired operating conditions can be maintained as close as possible during operation.

However, achieving such a proposed controller for control of interacting tank is quite difficult, and still provides challenging and interesting problems. This is mainly due to the inherent complexity of the interacting tank process which can be characterized by highly nonlinear behavior resulting from the dependence of the interaction of level and temperature. The level and temperature are available for direct on-line measurement. Although, in recent years (Toran *et al*. 2001) there have been significant advances in developing control system for control product properties, they have rarely been used in industrial processes due to the complex algorithm on the control system. Thus, the usual practice is to control the interacting tank process by LabVIEW program (National Instrument, 2000) in order to obtain desired product properties instead. The typical of this system is shown in Figure 1.

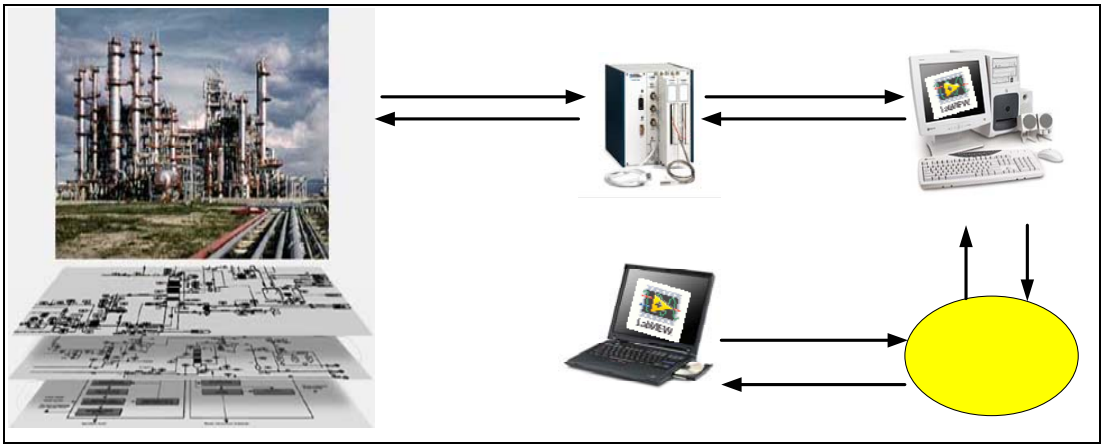

Figure 1 LabVIEW control on web-based

A user interface as the front panel is built by a set of tools and objects. The front panel can be controlled by block diagram connected with the graphical representations of functions to control the system. The front panel of interacting tank process controlled by designed controller on web-based can access through a server IP address of operating computer.

There are several designed controllers. Each designed controller has different advantage which is suitable in some cases. As the result, it depends on the needed process accuracy. Whatever, proposed controllers are implemented via LabVIEW program in order to control interacting tank process on web-based. It should be noted that the proposed strategies would be several strategies studied to promote the applicability of on-line dynamic control on web-based for implemented a interacting tank process. Finally, the on-line dynamic control on interacting tank process leads to an applicable, reliable and successful strategy for an actual implementation.

Objectives

1. To study advance control strategies.
2. To construct the tank rig with control system.
3. To develop the web-based style machine interface.
4. To apply the virtual instruments for tank control system.

Scopes of work

1. All equipment is an industrial grade.
2. The servo and regular problem are studied.
3. LabVIEW 8.0 is applied for process control.
4. There are four strategies used in this work, PID, IMC, GMC, and FLC.
5. The web-based style machine interface can be used with IE all versions.