ствует возможность выбора интерфейса из числа подключаемых. Ввод коэффициентов, в дальнейшем, будет осуществляться только для наглядности получаемых передаточных функций. При нажатии на кнопку «Построить график» получаем график передаточной функции.

На рисунке 2 представлен пример реализации части программы для идентификатора на ПЛК СП207 фирмы ОВЕН.

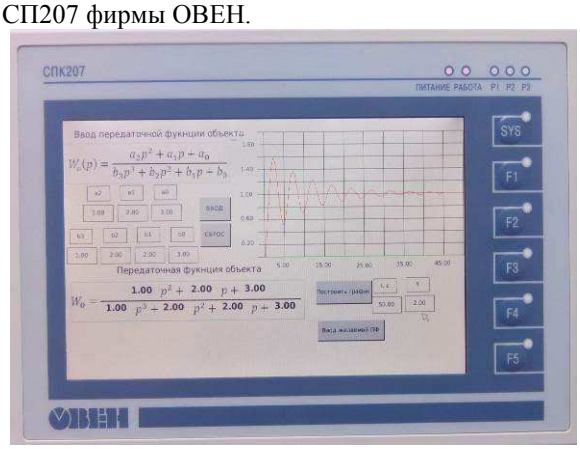

Рис. 2. Пример реализации на ПЛК функции построения переходной характеристики по передаточной функции

Результаты работы

В настоящее время существует алгоритм нахождения передаточной функции системы по полученной переходной характеристике. Имеется также программа, используемая в структуре персонального компьютера. На ее основе создается программа для выбранной аппаратной среды. Очередные шаги – создание модулей, направленных на уменьшение ошибки идентификации, в частности, уменьшение помех. Основой остаются алгоритмы, реализованные на персональном компьютере.

Заключение

Решена задача по выбору аппаратной платформы устройства – идентификатора. Программная среда находится в стадии разработки. Реализован модуль построения переходной характеристики по заданным значениям передаточной функции вплоть до 3 порядка.

Литература

1. Пат. 68722 РФ, МПК G05B13/00. Устройство идентификации объектов управления / Гончаров В.И. (РФ), Малиновский А.А. (РФ), Рудницкий В.А. (РФ), Джин Ил-Сонг (РК); ООО «Делик» (РФ). – №2006120066; Заявл. 07.06.2006; Опубл. 27.11.2006. – 5 с.

2. Лиепиньш А.В., Онуфриев В.А. «Аппаратно-программная реализация идентификатора объектов управления».

3. Официальный сайт компании ОВЕН [Электронный ресурс]. Режим доступа: http://www.owen.ru/catalog/52204806

UPGRADING AUTOMATIC CONTROL SYSTEM OF INFLOW OF HYDRATE DEVELOPMENT INHIBITOR

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Introduction

As it usually, a problem of investment less money resources in more perspective projects is widely distributed between companies which are concerned in investigating and adopting new innovative ideas into life.

Upgrading of already existed systems is also one of the most significant things. Some companies at all times provide different scholarships and rewards for new decisions in their area of interests.

The oil and gas industry faces increasingly difficult challenges related to hydrate deposits in pipelines as hydrates often form at inaccessible locations. Pressure and temperature conditions favourable for gas hydrate formation are commonly encountered during winter in onshore and in shallow water offshore fields, and regularly in deepwater fields offshore. Hydrates can not only form in transfer lines and tiebacks, but they can also form across gas expansion valves (rapid cooling) and during drilling following a gas kick. One of the problems other than blockage is the movement of the hydrate plugs in the pipeline at high velocity which can cause rupture in the pipeline. Any blockage in an oil/gas pipeline due to hydrate is a serious threat to the economic and cost effective strategy and also personnel safety.

The usage of methanol

However, thermodynamic inhibitor (methanol or glycols) injection is probably the most popular technique in preventing gas hydrate blockage. The amount of required inhibitor is usually measured in the laboratory or predicted using thermodynamic models for the specific fluid composition, water-cut and worst operating conditions.

The loss of inhibitor to the hydrocarbon phases and a safety factor should be considered in deter-

mining the required inhibitor dosage. Despite considering a safety factor, hydrate blockages occur due to changes in the system conditions, equipment malfunction or human error. This problem can be addressed by controlling the inhibitor concentration measured downstream.

Automatic control system of methanol's inflow

The system of automatic methanol's inflow is definitely needed to be installed. In this respect there are many various offers from different manufacturing companies.

One of the biggest and well-known Russian companies, Gazprom is using similar automatic system on the gas and condensate producing areas in the country's extreme north (Gazprom production Urengoy). The scheme of automatic control system of methanol's inflow is presented in the figure 1.

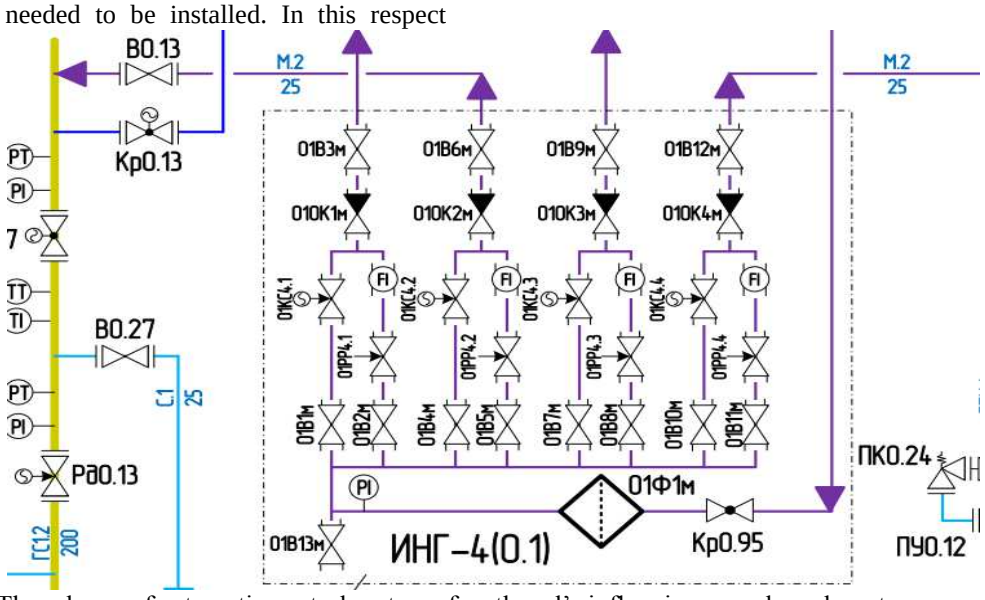

Fig. 1. The scheme of automatic control system of methanol's inflow in gas and condensate processing unit

The inflow of methanol into gas pipe line performs throughout the unit of hydrate development inhibitors (fig. 1) which are set up for automatic methanol's inflow with definite injection time and flow rate. The function of this unit is to provide dosing of methanol through four independent delivery pipes. Each delivery pipe has two self-determined flow rate control line:

- remote control line;
- manual control line.

In the unit of hydrate development inhibitors on the pipe-line of methanol M in flow's direction of product are installed the next stop valves:

1) a filter 01Ф1 is intended for methanol's refining;

2) valves B1…B4, intended for direction of methanol's inflow through the remote control line;

3) flow control regulators КС1…КС4, intended for remote control of methanol's flow rate;

4) valves B5…B8, intended for direction of methanol's inflow through the manual control line;

5) flow control regulators PP1… PP4, intended for manual control of methanol's flow rate;

6) back pressure valves ОК1…ОК4, intended for protection unit's elements from reverse gas flow and entry of gas into unit and pipe-lines.

7) valves B9…B12, intended for ending the process of methanol's inflow into the pipe-lines;

8) a valve B13 is intended for draining off the methanol during repair's session.

Valves 3Д1…3Д14 are installed in gas and condensate processing unit with electromotor which is intended for automatic closure of methanol's inflow on definite lease. Before the processing department the calve 3Д11С is installed for automatic closure of methanol's inflow into the area.

The idea of upgrading the existed system

During the internship in the company Gazprom it were brought to light that apart from everything else there are two similar automatic control systems of inflow of hydrate development inhibitor in gas and condensate processing unit. The first one was described above but the other one is installed directly in every lease of gas field. The difference between them is that on the second system there is no filter and reserve manual control line (fig. 2). The absence of filter makes this system less preferred.

From another point of view the usage of the second control system is more preferable due to the fact that the distance from each lease to gas and condensate processing unit is far enough. As a consequence the ability of formations of hydrates in this direction sufficiently large and it can cause many problems with delivery of gas and condensate in the processing unit. Also there will be obstacles with technical support and assistance in this area. In

connection of this the first system usually does not use in the organization of Gazprom (Gazprom production Urengoy, gas condensate field 22). That shows us incomprehensible waste of money resources into this automatic control system. As a result leading-edge solutions appear for the reason to find the efficient way of solving the problem.

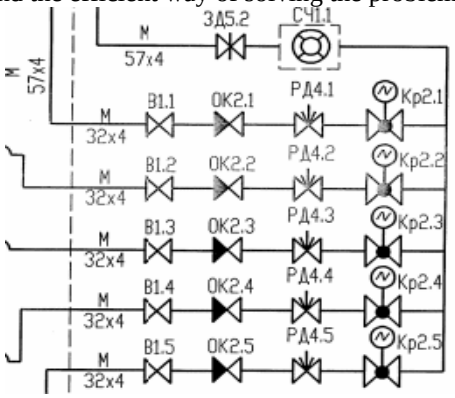

Fig. 2. The scheme of automatic control system in the lease

The idea of upgrading is to install the same filter as it settled in the second control system and to implement bypass with the manual control for emergency situations. Afterwards the usage of the system installed on the lease will be worthwhile. Denial of the system in the gas and condensate processing unit could increase the space, the factor of safety in the building and also increase the economic factor during design new-built fields. Or even better decision is simple changing two automatic control systems with each other. As it was said above it is better to use the second automatic system therefore it is more priority to invest more money on such systems which will be installed on the leases.

Conclusion

These leading-edge and efficient ideas were introduced to the chief executive managers of gas and condensate field 22 during the internship. The concept of upgrading automatic control system of inflow of hydrate development inhibitor was highly respected by the authority of company. However any modifications in the technological process of gas and condensate field could be realized only after writing the report to the department of Gazprom production Urengoy. All the developments which are somehow could be connected with improving the technological process and decreasing expense of money resources are always meaningful to any company.

References

1. 23rd International Oil Field Chemistry Symposium [electronic resource] // Collected works of conference. – URL: http://www.hydrafact.com (date accessed: 13.10.13);

2. Hydrate inhibitors [electronic resource] // Oil and gas encyclopedia. – URL: http://www.mining-enc.ru (date accessed: 13.10.13);

3. Automatic control system of inflow of hydrate inhibitor [electronic resourse] // Production automation. – URL: http://p-sr.ru (date accessed: 14.10.13);

4. Gas and condensate processing unit [electronic resource] // The official web-site of Gazprom – URL: http://www.gazprom.com (date accessed: 14.10.13).

АНАЛИЗ И УПРАВЛЕНИЕ ЭНЕРГОПОТРЕБЛЕНИЕМ В ЖИЛЫХ ДОМАХ С ИСПОЛЬЗОВАНИЕМ МОБИЛЬНОГО ПРИЛОЖЕНИЯ

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Аннотация

В данной статье описывается процесс создания программно-аппаратной системы для снятия показаний потребления электроэнергии в жилых домах и оповещения пользователей с помощью мобильного приложения. Система используется для предоставления данных о потреблении электроэнергии разработчикам мобильных приложений с помощью API для интеграции аппаратных устройств в сторонних приложениях. Данная система также может быть использована для проверки состояния включено-выключено электроприборов в квартире и анализа потребления электроэнергии в течение суток. Система легко может быть модифицирована для управления потреблением электроэнергии. В качестве аппаратной платформы выбрано Arduino Uno, серверной части – база данных MSSQL, мобильного приложения – платформа Windows Phone 7.

Введение

Arduino – это электронный конструктор и удобная платформа быстрой разработки электронных устройств [1]. Платформа пользуется огромной популярностью во всем мире благодаря удобству и простоте языка программирования, а также открытой архитектуре и программному коду. Устройство программируется через USB без использования программаторов.

Arduino позволяет компьютеру выйти за рамки виртуального мира в физический и взаимодействовать с ним. Устройства на базе Arduino могут