Automation of Oil Blending System

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Abstract— Automation of oil blending system is utilized to automate the blending system of oil. This process is to decrease the crystallization property of the palm oil by mixing the two different oil namely palm olein and Canola oil with different ratios of oil contained and mixing temperatures. Blends of 25% and 35% canola oil with 70% and 80% palm olein respectively were blended at different temperatures 18, 23 and 27°C.We utilizes here batch process to get different quality of palm oil.

Keywords— Automation; canola oil; crystallization; palm olein.

I. INTRODUCTION

Oil blending is the mixing of two different oils. Oils are available with positive and negative nature. However to overcome the negative nature or property of the oil the blending of oils are carried out. The blending ratios are decided by studying the different types of vegetable oils and its physical and chemical nature. The vegetable oils show the changing physical and chemical property with time and heat effect. Palm oil crystallized at room temperature. However to improve this property we utilized this system or process. For domestic purpose the clouding point of oil should be less than room temperature. As per the requirement of low crystallization of oil, soybean oil, cottonseed oil, sunflower oil shows the varying behavior with temperature and time changing. The canola oil gives good low crystallization nature. In this process we blend the two different oils namely canola and olein oil. We take their ratios 1:2.8 and 1:2.3 (canola oil: palm oil) with varying temperature .the temperature are varied like 18, 23 and 27°C to get different quality of product. In this process automation is also the main part. With the automation of the system we get accuracy, repeatability, safe production system and quality. In automation the data is gathered by field sensors/instruments in the form of digital and analog signals through cable to the input cards of PLC and is then processed as per the programmed logics in the system. After processing of the data the relative action is ordered to field instruments in the form of digital/analog signals which are further converted to electrical and pneumatics by converters.

II. CRYSTALLIZATION

Crystallization is the process of formation of solid crystals precipitating from a solution, melt or more rarely deposited directly from a gas or we can say that crystallization is a chemical process where solid and liquid separation occurs in material. The crystallization behaviour of any oil is describes its working capacity with temperature. Crystallization point of any material differs with its different application. However to keep flexibility in oil we need to improve the crystallization point of the oil. That is reason why we blend the oils with each other, with different ratios and different operating temperature.

In this case we required low crystallization behaviour of palm oil. So we blend the palm oil with canola oil.

A. Palm Olein

In case of palm oil, it crystallized at temperature below 22°C the crystallization of palm oil was observed to occur in a two-stage process. This two-stage process was utilized by the fractionation of palm oil, most probably into the stearin and olein fractions (5). The iodine values of the olein and stearin fractions increased as the crystallization temperature decreased and both fractions started at cloud at lower (4).

B. Canola Oil

Polymorphism is a well-known phenomenon associated with the crystallization behaviour of long chain compounds. Fats can crystallize into a number of sub-crystalline forms such as α, β, and β', each differing in size and stability of the crystals. Canola oil remains free from clouding when held at 4° C or 0° C for 15 hrs (3). This is reason why we utilize the canola oil with palm oil. Canola oil prevents the palm oil from clouding at low temperature. The canola oil shows the good viscosity.

III. METHOD

In this process we blend the palm olein with canola oil using batch process. Our aim is to automate the whole process. So automate the batch process we utilized the PLC. And for getting the visual control we utilize the SCADA System. The Selection of PLC and SCADA Controller is dependent on our requirement of no. of I/O, flexibility, Hardware platform etc.
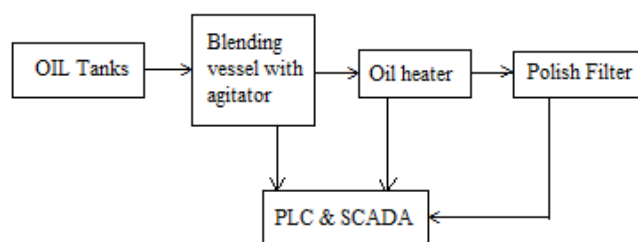
A. Block Diagram

Fig.1. Block Diagram of blending system.

B. Procedure

The input palm olein and canola oil is mixed in the Blending vessel. The required proportion of oils maintain by programming on PLC system. The mass flow transmitter is utilized to give the feedback to the PLC. It measures the amount of output flow of tanks of palm olein and canola oil. When the oils are entered in blending vessels the stirred starts moving. At a time we fill only one tank. After filling the tank we stirred it for some time. Then it transfers towards polish filter. Polish filter helps to acknowledge the quality of product oil. If any quality issue is observed then it again transfers the mixture to blending vessel. Otherwise it drawn from polish filter in the collection tank. In this process we utilize the level transmitter to maintain the level of the oils in the tanks. Pressure transmitter for maintain the pressure on oil for heating process and temperature transmitter to maintain the exact temperature of mixture. These transmitters are utilized to get the feedback for PLC and SCADA systems. As shown in the fig 1. We can see that how the PLC and SCADA can helps to automate the process.

C. Ratios

Here we can utilize different ratios of palm olein and canola oil to decrease the crystallization of palm oil. . Blends of 25% and 35% canola oil with 70% and 80% palm olein respectively were blended at different temperatures 18, 23 and 27°C. Heat this ration of oil mixture for 5 to 7 hrs.

IV. INSTRUMENTS DESCRIPTION

We install the batch process here. Through batch process we can blend different types of oils to get different quality of oil in affordable price. Oil blending process needs large time to complete the whole process. We can get the two different products at a time using batch process. In the oil blending system the instrument should be workable with viscose fluid.

A. Blending Vessel

Tanks with top and bottom dished ends complete with heating coil, agitator, and suitable geared motor and complete with all the nozzles.
Capacity: 25MT
Dish thickness: 10mm
Geared Motor: 5.5kw * 60 rpm
Working fluid: vegetable oil
Working temperature: 100° C
Working pressure: 50mm of Hg

B. Oil Header

This is the plate type and is designed to heat vegetable oil from material of construction.
Bars and supports: steel
Design temperature: 130° C
Design pressure: 8 bar

C. Catch vessel

To collect the moisture from the mixture of the oils.

D. Polish Filter

This the filter utilized to check the quality of oil and recirculation of mixture of oil. Here this filter is check the viscosity,

E. Transmitter

As per the requirement we utilize here different type of transmitters. The different type of transmitter with their description and operating range are mentioned in table I.

TABLE I. Types of transmitters.

Sr.no	Description	Operating range	Input	No of items
1	Mass flow transmitter	400-42000 Litre/hr.	4-20 mA	1
2	PLC based PID Temp. Controller	0-150°C	4-20 mA	2
3	Level Transmitter	DP type	4-20 mA	2
4	Pressure Transmitter	0-100 mBar	4-20 mA	2

F. Actuated ball valve

In this batch process we need valves to actuate the process. Type: Ball valve
Operating range: 24V DC supply
No of valve utilized: 18

V. ADVANTAGES

Automation of oil blending system is utilizing for decrease the crystallization of palm oil using blending with canola oil. We can work on two different quality of product at a time by using the batch process. The automation of this system gives us accurate product quality. And if we want to change the ratios we have just change the programming of PLC. This time taking process becomes very easy to operate by automation.

VI. CONCLUSION

This process gives us different product of palm oil with different crystallization nature. And also we can get how and why to utilize the canola oil with palm olein to decrease the crystallization of palm oil. Blending of oils gives us the cost effective product.

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