



Create an ISA-88 batch recipe for 100kg cocoa milk production. Ingredients should include milk, water, liquid sugar and cocoa. Equipment consists of a mixing and blending vessel able to stir and heat. Provide adequate amounts and temperatures.



ISA-88 Batch Recipe for 100kg Cocoa Milk Production

Objective: Produce 100kg of cocoa milk using milk, water, liquid sugar, and cocoa powder with a mixing and blending vessel capable of stirring and heating.

Ingredients:

- 1. Milk - 70kg (70%)
- 2. Water - 20kg (20%)
- 3. Liquid sugar - 5kg (5%)
- 4. Cocoa powder - 5kg (5%)

Equipment:

- 1. Mixing and blending vessel with stirring and heating capabilities

Procedure:

- 1. Preparation:
 - a. Ensure that the mixing and blending vessel is clean and sanitized.
 - b. Gather and measure all ingredients according to the specified quantities.
- 2. Mixing:
 - a. Pour the 70kg of milk into the mixing and blending vessel.
 - b. Start the stirring mechanism to create a vortex in the milk, with a stir rate of 100 RPM.
 - c. Gradually add the 20kg of water into the milk, ensuring it blends thoroughly.
 - d. Once the milk and water have been mixed evenly, slowly pour in the 5kg of liquid sugar, allowing it to disperse evenly throughout the mixture.
 - e. Finally, add the 5kg of cocoa powder into the mixture, ensuring it is evenly distributed.
- 3. Heating:
 - a. Set the vessel's temperature control to 65°C (149°F) to pasteurize the mixture and enhance flavor.
 - b. Maintain the stirring rate at 100 RPM during the heating process.
 - c. Heat the mixture for 30 minutes, ensuring even temperature distribution and preventing any scorching or settling of ingredients.
- 4. Cooling:
 - a. After the 30-minute heating period, begin to cool the mixture down to 4°C (39.2°F) using a cooling system or a heat exchanger.
 - b. Continue stirring during the cooling process to ensure even cooling and prevent any separation of ingredients.
- 5. Final product:
 - a. Once the cocoa milk has reached 4°C (39.2°F), stop the stirring mechanism.
 - b. Transfer the 100kg of cocoa milk to a storage tank or packaging system, ensuring proper hygiene and sanitation practices.
- 6. Clean-up:
 - a. Thoroughly clean and sanitize the mixing and blending vessel after use to prepare for the next batch.

This ISA-88 batch recipe will yield 100kg of cocoa milk with a balanced flavor profile and smooth texture. Adjust the ingredient proportions and processing temperatures as needed for optimal results.



Write a self-contained 61131-3 structured text program for the sequential control of the mixing with typical parameter values.



The following IEC 61131-3 structured text program uses sequential control for mixing the ingredients in the cocoa milk production process. This example program assumes the use of a PLC (Programmable Logic Controller) with inputs, outputs, and timers. Please adapt the program to your specific PLC and input/output configuration.

iecestCopy code

```
PROGRAM CocoaMilkProduction;
(* Declare Variables *)
VAR
    Start: BOOL := FALSE;
    Stop: BOOL := FALSE;
    MixingMotor: BOOL := FALSE;
    Heater: BOOL := FALSE;
    MixingDone: BOOL := FALSE;

    Temperature: REAL := 25.0; (* Current temperature in degrees Celsius *)
    TargetTemperature: REAL := 65.0;
    CoolingTemperature: REAL := 4.0;

    Step: UINT := 1;
    StirringRate: REAL := 100.0; (* RPM *)

    MixingTimer: TON;
    MixingTime: TIME := T#30m; (* 30 minutes mixing time *)
END_VAR

(* Main Control Logic *)
METHOD Main: BOOL;
BEGIN
    IF Start AND NOT Stop THEN
        CASE Step OF
            1:
                (* Start Mixing *)
                MixingMotor := TRUE;
                Heater := TRUE;
                MixingTimer(IN := TRUE, PT := MixingTime);

                IF MixingTimer.Q THEN
                    MixingDone := TRUE;
                    MixingMotor := FALSE;
                    Heater := FALSE;
                    MixingTimer(IN := FALSE);
                    Step := 2;
                END_IF;
            2:
                (* Cooling Process *)
                IF Temperature > CoolingTemperature THEN
                    MixingMotor := TRUE;
                    Heater := FALSE;
                ELSE
                    MixingMotor := FALSE;
                    Heater := FALSE;
                    Step := 3;
                END_IF;
            3:
                (* Process Complete *)
                MixingDone := TRUE;
                MixingMotor := FALSE;
                Heater := FALSE;
            END_CASE;
        ELSEIF Stop THEN
            MixingMotor := FALSE;
            Heater := FALSE;
            MixingTimer(IN := FALSE);
            Step := 1;
        END_IF;

        RETURN MixingDone;
    END_METHOD;
END_PROGRAM;
```

This program has a simple structure where the main control logic is within a METHOD called "Main". The variables "Start" and "Stop" are used to control the process. The variable "Step" is used to move through the sequential steps of the process, and the mixing motor and heater are controlled accordingly. A timer, "MixingTimer", is used to maintain the mixing process for 30 minutes.

Make sure to adapt this program to match the specific inputs, outputs, and timers available on your PLC system. Additionally, you may need to add external control logic for temperature measurement and control based on your PLC capabilities.

