

# Improving Precision of Weigh Stones by Production Asphalt Blends in Automatic Mode

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*Abstract: The aim of this paper is application of finish weighing equipment for asphalt mixing plant with target on improvement precision weighing of stones at production of asphalt mixtures.*

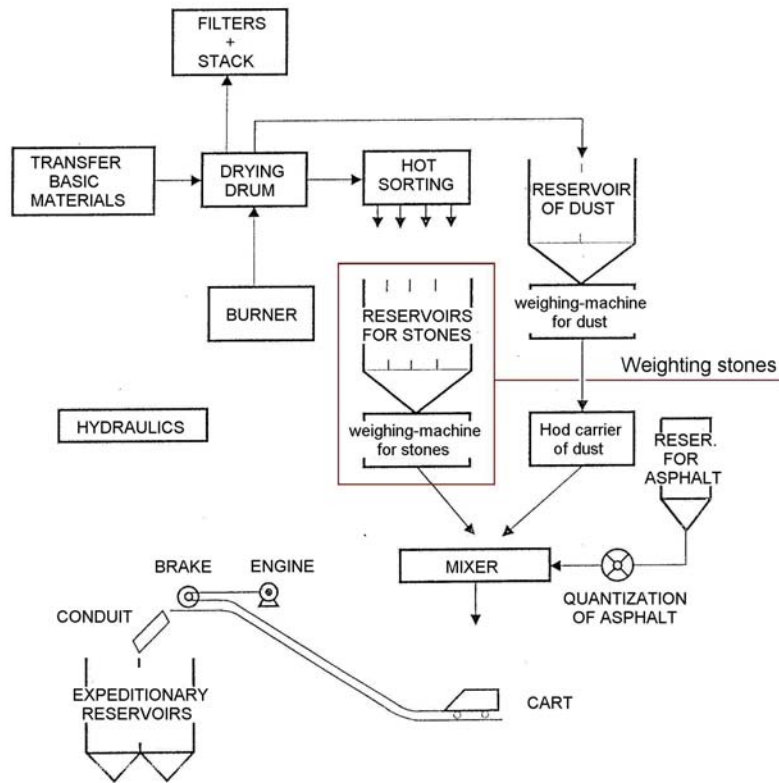
*Keywords: Asphalt mixing plant, Finish weighing equipment, Scale for stones, Reservoirs for factions, Decoding equipment, PLC – Programmable controller*

## Introduction

Production asphalt blends belong to the area of technological processes at industrial manufacturing. This area is markedly stigmatized application of automation and informations, that allow optimization industrial process, improve qualities and increase productivity of labour.

Asphalt mixing plant servient on mode of production asphalt mixture, is complex automatically controlled system. Asphalt mixing plant according to technically-qualitative condition [5] must be project and controlled so as manufacture asphalt mixture according to evidentiary test. It must be equipped powerful drying and hot equipment on stones, reservoir with metering equipment on hot stones and asphalt, and additional machineries, which ensure sustainment settings incandescence mode and ideal interfusion mixture stones by bitumen according to manufacturing recipe. Control system of asphalt mixing plant has have control over automatic operation, monitoring working values and capture statistical registrations about production.

Asphalt mixing plant consists of several subsystems. Within operatives, from views effect on resultant quality, are: drying drum, hot sorting, and weighing-machine for stones, dust and batching asphalt, mixer.



Structural design own technology of asphalt mixing plant [2]

Production asphalt mixture must be in asphalt mixing plant assign, so as all boulders of stones to be at launched fully encapsulated by binding and subduction samples compliance after examining requisite value. All input of materials must before insert into mixer of asphalt mixing plant, exactly measure out (weigh out) and heat up on regulation mixing heat [5].

Current problem is mainly precision quantization stones - weighting stones in the process of production. Norm for stones usher tolerance  $\pm 4\%$ , for quantization asphalt  $\pm 2\%$  (STN 73 6121 - manufacturing and examination comprehensive bituminous layers for roadways from buildings mixtures).

Reasons of put more precisely weighting stones of faction 0-2 we obtain, If perform calculations specifically surface individual faction stones. From calculations be evident, that the biggest proportion on composition of mixture has the most soft-grained component stones, so it is faction 0-2. Upon this component is binding substantial quantity asphalt (adhesive) – not until about 70%.

Imprecision weigh out this component stones (appertain it mainly of instance pouring) is cause, that resultant mixture it needs alternatively has excess asphalt. This actuality markedly impact on eventual mixture quality and consumption of material (especially asphalt).

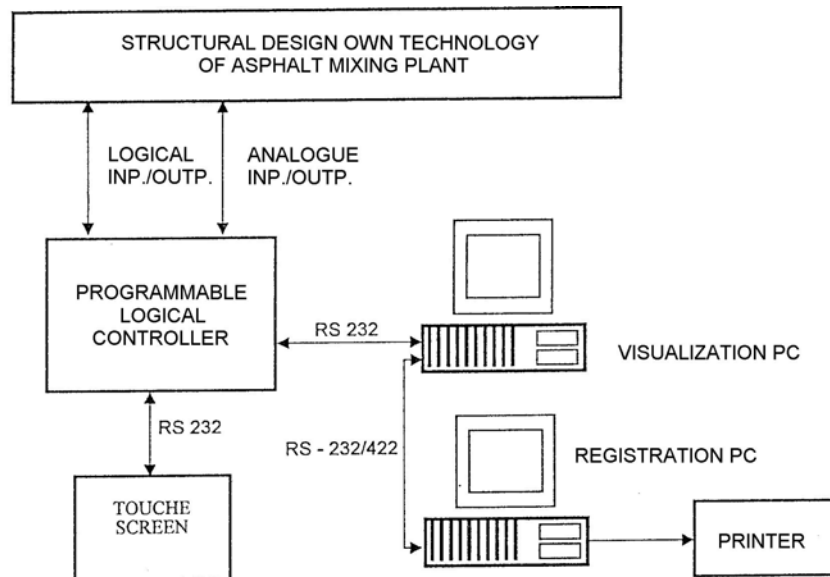
Largeness of batch can be from 800 to 1200 kg. Thereof quantity the biggest component is stones about the size 0-2 mm, q.v . stones of the most soft-grained faction. This stones is uses in 99% producing asphalt mixture.

## **1 The Present State of Weighting Stones**

Control of asphalt mixing plant, include weighting stones, supply control system of asphalt mixing plant, which consist of programmable logical controller (PLC), visualization PC, touche screen and registration PC (automatics with PC+PLC and separate functions). This control is results progressive development automation of asphalt mixing plant, which initiate using relay automatics.

Note.: The modernization process of control system on the present still continue on some asphalt mixing plants, especially older types /succeed higher precision come to important problem/.

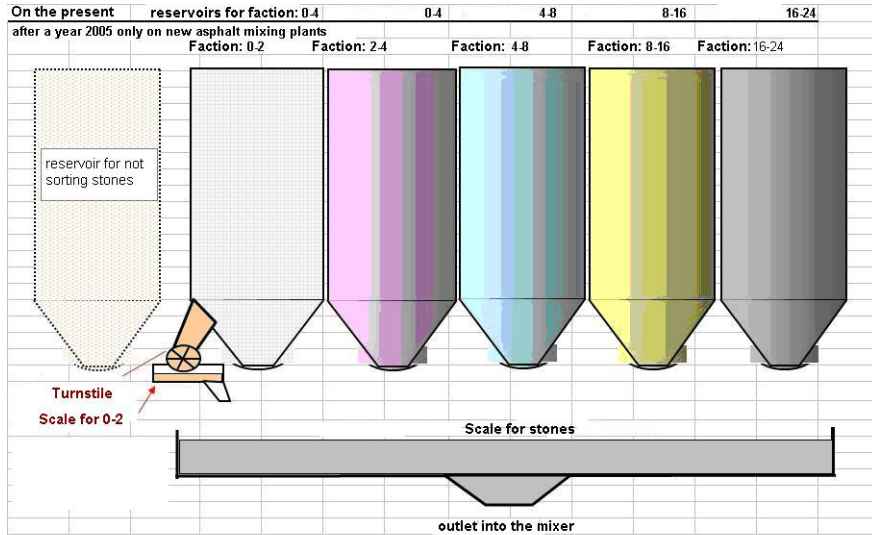
This control system with PC+PLC and separate functions handling, without problems communications, with operator processing and data acquisition. Perform analogue regulation, supply visualization technology of asphalt mixing plant on relatively high level, inspect quantitative flow of materials etc. Touche screen substitute before used control board of handling, what makes it possible to comfortably operate running to asphalt mixing plant.



Automatics with PC+PLC and separate functions [2]

## 1.1 Technology of Weighting Stones

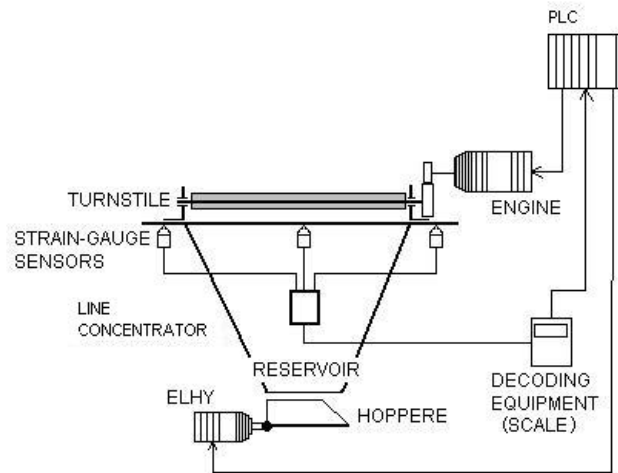
Weighting stones overshoot on weighing-machine consist of reservoir situated on strain-gauge sensors. Stones from individual reservoirs divided to factions (0-2, 2-4, 4-8, 8-16, 16-24) are pouring in sequential succession into the weighing-machine. Pouring stones to weighing-machine supply hoppers individual reservoirs control by electrohydraulic engines. Engines are controlled by signal from PLC. PLC keeps open hoppere, while weigh out required value stones. Reading from weighing-machine is converting from strain-gauge sensors by decoding equipment. That is connecting on PLC through analogue input units.



Reservoirs for stones (faction 0-2 complement by finish weighing equipment).

## 2 Design Solution

Design solution additional finish weighing equipment for faction 0-2, so as avoid over-balanced up 100% scales stones appointed prescriptions.

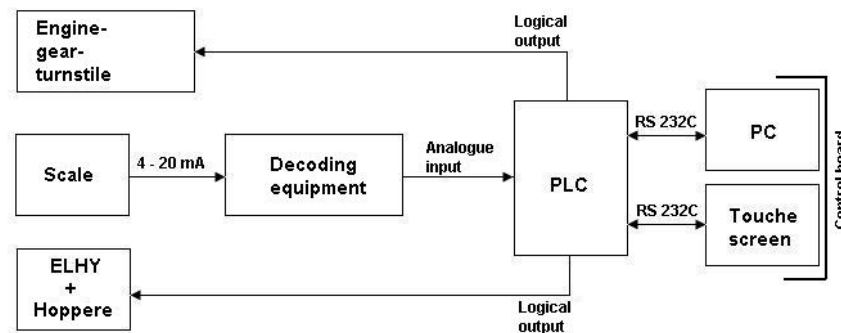


Technological scheme of finish weighing equipment

## 2.1 Working Principle Finish Weighing Equipment (FWE):

Process of weighting begins by selection particular prescriptions in control computer. That includes asked values of weights individual kind of stone, which are used for given type asphalt mixture. Process of finish weighing is applies only for stones 0-2. Operation of weighting stones works in tolerance zone  $\pm 4\%$ . For effectiveness equipment with FWE is positive divergence objectionable. Therefore in control computer (visualization PC) for process weighting perform modification asking scales of stones 0-2. This modification be in reduced this value on maximal positive divergence, that is 4%. After this modification follow display asking values for stones automaton. In this condition will be system weighting stones scale 96% from really asking values given prescriptions. Tolerance zone will be about 92% to 100% asking values for stones 0-4 given prescriptions. Finish weighing will be distinction within really weigh out and asking weight.

Finish weighing assign dosing device include turnstile and his drive. Drive consists from gearbox and asynchronous engine. Stones are measure out into own scale FWE. Scale is consisting of reservoir situated on strain-gauge sensors. Signal from strain-gauge sensors is paced at decoding equipment. Dumping stones from reservoir into grounded weighing-machine stones supply hoppere, which control by electrohydraulic engines. All control of finish weighing equipment supply programmable controller. Subtraction scale from decoding equipment, practise by means of analogue signal, through analogue input unit, which has nature inputs 4 – 20 mA. Motor control of turnstile and engine of hoppere (operating device ELHY) is executing through unit relay output of PLC.



Flow diagram of finish weighing equipment

## 2.2 Selection Components and Devices

Components and devices for finish weighing equipment are selecting with reference to nature input-output units of PLC, low prices, compatibility, easy service, easy applications and operations.

## **Conclusion**

Main meaning solution of giving precision to weighing stones at production asphalt mixtures by finish weighing equipment is achievement asking qualitative values and material saving. Solution makes it possible to exact on-weighting stones without elongation production cycle. Finish weighing equipment has been design than single mechanic equipment with ability relatively modest of installation on asphalt mixing plant by condition relatively little encroachment on frame method quantization stones.

This application will be suitable solution problems with precision weighting stones at production asphalt mixtures on new asphalt mixing plant, also on asphalt mixing plant of older types.

## **References**

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