Simulation of Color Mixing Machine in EKTS and Speed Control Using VVVF

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Abstract: Electronic gadgets, for instance, may make inrush flows as their inside power supply and channel circuits start. These inrush flows regularly last just a small amount of a second, and only here and there causes an issue. The execution works in the proposition of the Color Mixer Machine which have the plan for beating the over-burden, the postulation center around the plan of the color mixer machine which can works in the forward and reverse way and utilizing the 3-phase induction motor. The deigns simulation of the Color mixer machine is done on EKTS. Together with that the simulation and the concept analysis is also done on the MATLAB where the speed control strategy of the 3-phase induction motor is also discussed using VVVF Control..

IndexTerms – Overload Protection, Speed Control ,Color Mixer.

I. INTRODUCTION

Most force quality issues are stowed away from ordinary service bills and plant data frameworks, yet their results incorporate plant vacation, diminished limit, creation squander, untimely hardware disappointment, utility punishments, and huge monetary impact. And in the late years, the electric based utilities' capacity to convey solid clean force has gotten progressively more troublesome. In their hurry to fulfill sustainable power portfolio guidelines, sun oriented and wind ranches have made genuine lattice solidness challenges. Also, this strain on the utilities, in blend with the expansion in electronic hardware utilized in modern offices implies power quality occasions are just expanding.[1]

1.1 Sag/Swell

Reasons for lists incorporate a short out, over-burden, or the turning over of enormous based motors. The swell one that can happen when the huge burden is killed. Utility network tasks, harmed voltage controllers, wiring issues, or even a sun oriented ranch increase and down on an overcast day are other likely reasons for hangs and swells.
As far as their effect to a plant, a droop risks closing down gear (particularly modern PCs and PLCs). The two hangs and swells could bring about breakers stumbling or move plans sequencing, contingent upon the plan of the electrical framework.
For observing purposes, we commonly suggest droop limits be set at the 90% of ostensible voltage and the swell edges be set at every available ounce of effort of ostensible voltage. These limits are additionally suggested inside IEEE based Standard 1159, one which is considered as the industry based standard covering the power related quality checking. [2]

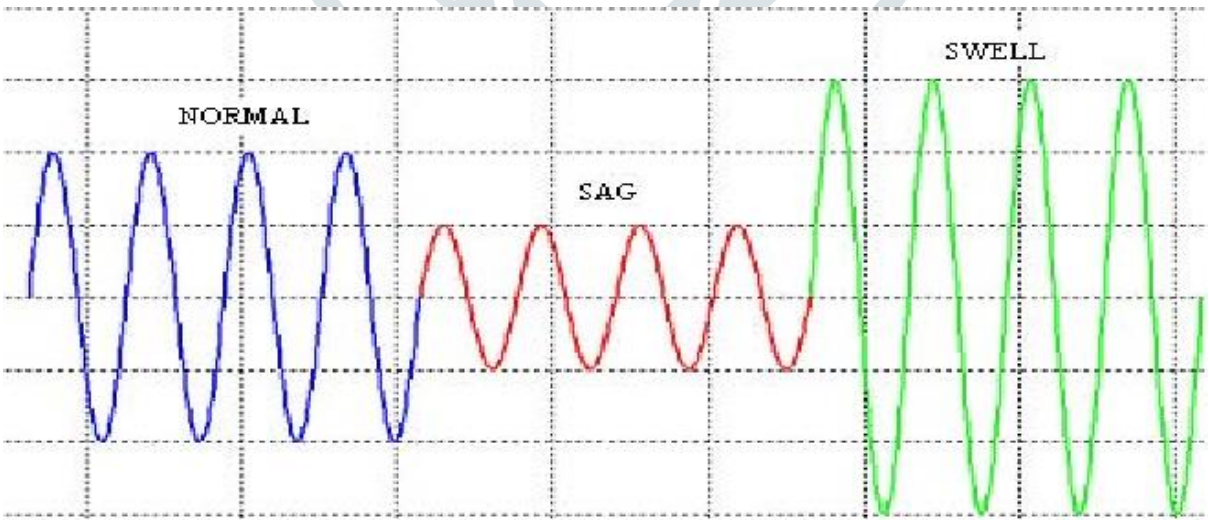


Fig 1 Sag and Swell

1.2 Transients

Quite possibly the most harming voltage unsettling influences are the transient (or the spikes). Like the swells, the transient is considered as the condition where the voltages are on the electrical based frameworks is comparatively higher than the normal voltages. The distinctive attribute of the transient is also the term. The transient normally happens with the case of electrical based cycle, one which implies it's length is under the 1/60th of the second. Homeless people can possibly harm gear with the power

related supplies, particularly PCs, also the instruments, and also the control gadgets. Drifters additionally spell destruction to modern offices that will produces the memory and also the processors in case of these gear (e.g., the semi-conductor makers). Over the long haul, rehashed homeless people will make hardware flop rashly. [3]

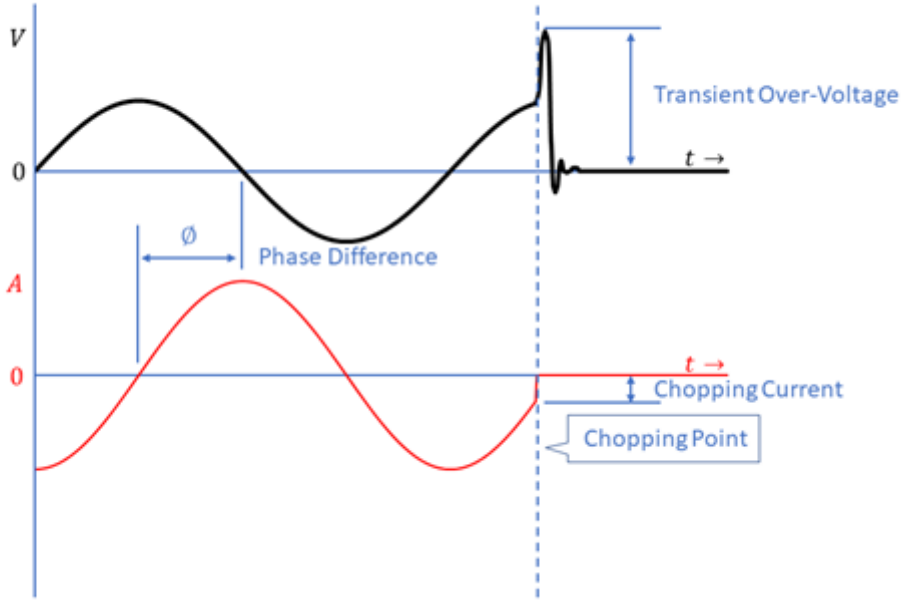


Fig 2 Transients

1.3 Harmonics

Sounds (also known as boisterous/messy power) are mutilations to voltage and current sign waves. In the event that gear in a modern office works by changing sign wave conduct among the AC and also the DC, after that it will then cause consonant mutilation. This hardware incorporates the variable speed drives, heaters, light weights, and the DC related power supplies one in case of PCs/other related electronic gear. [3]

As indicated by the IEEE 1159 norm, voltage symphonious bending ought to be held under 4% to dodge issues with incredibly touchy gear like lighting and PCs. Consonant bending issues are one of the greater likelihood reasons of personal time and why hardware neglects to appropriately work.

High symphonious substance in a framework can possibly cause disturbance stumbling, and increment heat in directors and motor windings. Sounds additionally lessen your force limit.

1.4 Power Factor

Power factors (PF) is considered as the proportion of the genuine capacity to the obvious force. At this point one when the voltages and also the flows inside a force framework are in phase, the force factor is viewed as solidarity or 1 and also the heap is absolutely resistive.[3]

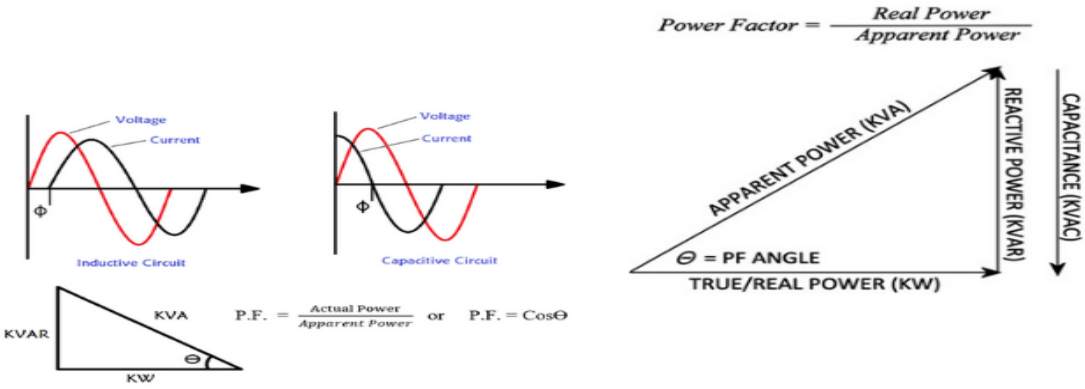


Fig 3 Power Factor

II. Literature Review

Wei Hu, Fei Xu, Kaiyuan Hou and Shengwei Mei [4] The unique voltage related security controls, the idea and strategy for the crossover control framework are presented, and also the powerful mixture automatic voltage control related (D-HAVC) based framework is figured it out. The half breed various leveled control framework model dependent on the mixture hypothesis is set up initially.

H. Huang, L. Nie, G. Skillet and M. Xia [5] Unwavering quality and strength of these units are preconditions for wellbeing of huge matrix. Also, the automatic control framework and control procedure with great execution are the reason for wellbeing and steadiness of power plant. SC and USC are multi-inputs, multi-yields framework with solid coupling and nonlinearity. Great execution couldn't be accomplished by utilizing customary PID control innovation.

This paper initially presents how installed Active Disturbance Rejection Control calculation is executed in DCS. At that point, the ADRC composed control plot for the Super basic one-through power age unit is introduced.

N. Gupta, N. Kumar and N. Singh [6] Essentially, the tuning of Integral regulator (IC) in the AGC technique of the three indistinguishable limit controls regions as non warm, the hydro and also the gas power framework joining SMES is investigated. The framework dynamic solidness is represented by contrasting recurrence reactions, the settling time, the top overshoot and execution file estimation of the framework.

M. G. Popov, D. E. Petrushin and N. S. Efimov [7] More than of the 60 % of the crisis control based gadgets are then made of the electro-mechanical components and, also by prudence of their plan highlights and the metrological attributes don't meet all advanced administrative necessities. Creators the current investigation breaks down the mishap which brought about isolating considered power frameworks with the Unified Energy System of the country Russia. It uncovers mistaken offbeat mode disposal gadgets activity. The examination recognizes that the glitch is because of the inaccurate settings of the trigger body. The investigation permitted to decide the point of thier PhD theory, which is in order to improve crisis control framework.

H. Zhong-xu, H. Huan-pao, Z. Zhi and S. Ying [8] Automatic age control (AGC) is a fundamental necessity of current power framework automatic based controls. As of now, moderate reaction to the AGC based load requests is the major issue existing in the nuclear energy units partaking in the AGC, one which then makes the control based executions of the power based framework AGC poor.

S. Corsi, M. Pozzi, M. Sforna and G. Dell'Olio [9] this study paper gives an overall portrayal of the attributes of these of the new automatic based control mechanical assemblies and of the intercessions needed on the existing hardware for their establishment, actuation and activity. A short introduction of the principle dynamic execution of the various leveled control framework, from the inward to the external control circles, is likewise given regarding lab, appointing and field tests. .

III. PROPOSED WORK

In the proposed work the concept of the Electricity Control System is simulated with the demonstrating of the Color Mixer System which will operate in the forward as well as the backward direction and the simulation of that is done using the MATLAB. The motor which is used for the operating of the system is the 3-phase induction motor , so we also analysed the speed control of the induction motor using the VVVF control.

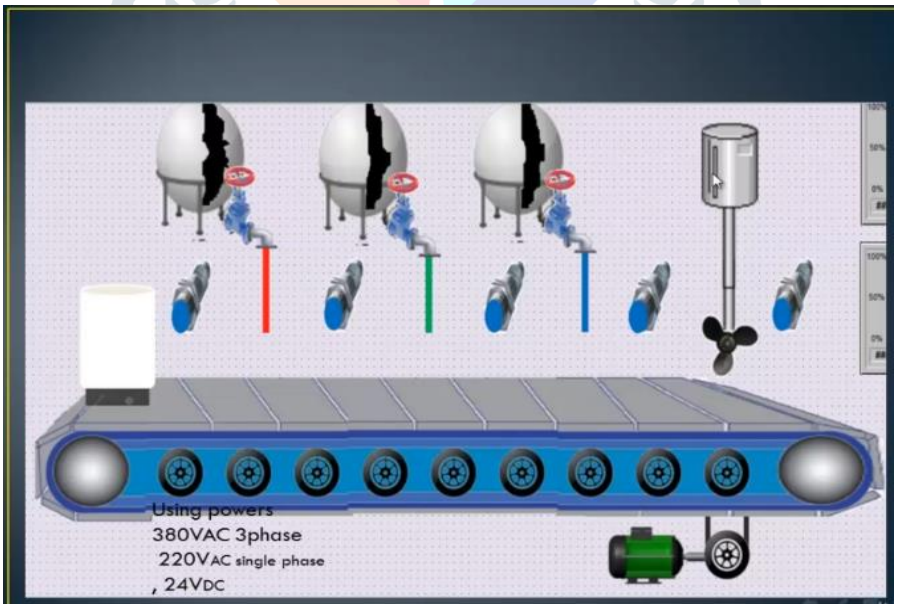
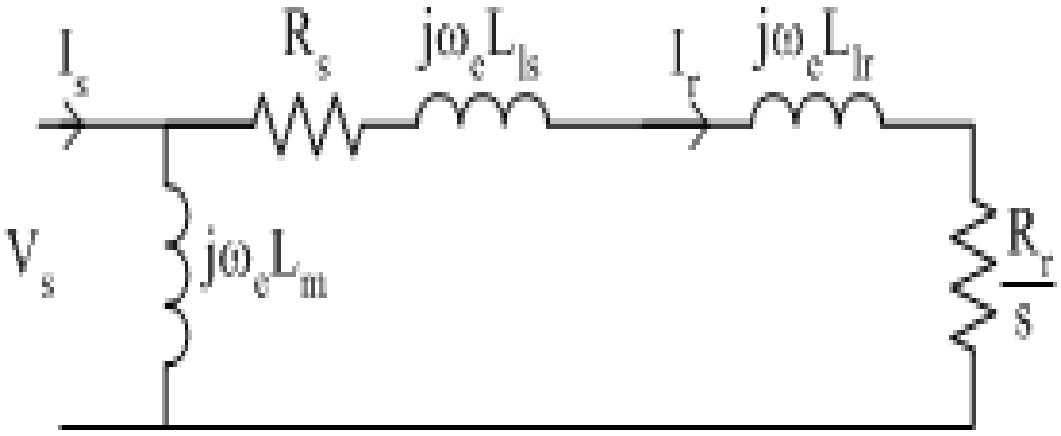


Fig 4 Proposed System

Speed Control for 3-Phase Induction Motor using VVVF

With variable voltage, variable repeat movement, any blend of voltage and repeat can be used to supply the motor, with the condition that action should remain inside the limits of assessed voltage a frequency.AS was appeared with the fixed repeat notes, if the voltage drop over the stator is superfluous in regard to the voltage drop over the charging reactance, it is reasonable to re-draw the indistinguishable circuit with the polarizing branch at the terminals of the circuit.



Investigation of the circuit prompts the accompanying torque condition

$$\tau = 3\frac{p}{2}\frac{R_r}{\omega_{sl}}\frac{V_s^2}{\left(R_r+\frac{R_r}{s}\right)^2+j\omega_e^2\left(L_{lr}+L_{ls}\right)^2}$$

As of now, exceeding any and all expectations, if the charging voltage is close to the stator supply voltage, by then the stator resistance can be overlooked from the force conditions:

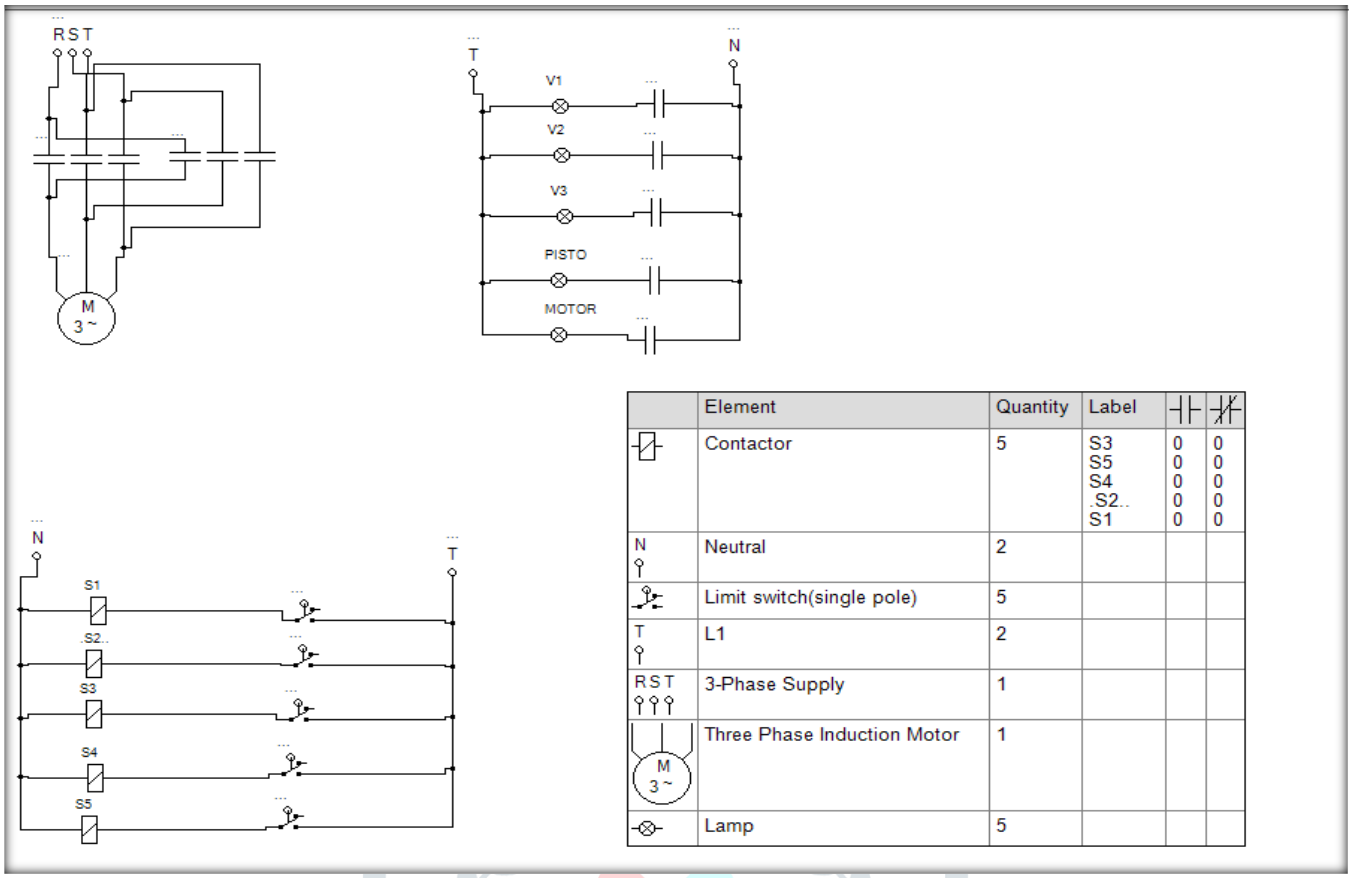
$$\tau \approx 3\frac{p}{2}\frac{R_r}{\omega_{sl}}\frac{V_s^2}{\left(\frac{R_r}{s}\right)^2+\omega_e^2\left(L_{ls}+L_{lr}\right)^2}$$

$$\tau \approx 3\frac{p}{2}\frac{R_r}{s\omega_e}\frac{s^2\omega_e V_s^2}{R_r^2+s^2\omega_e^2\left(L_{ls}+L_{lr}\right)^2}$$

$$\tau \approx 3\frac{p}{2}\left(\frac{V_s}{\omega_e}\right)^2\frac{\omega_{sl}R_r}{R_r^2+\omega_{sl}^2\left(L_{ls}+L_{lr}\right)^2}$$

IV. PROPOSED WORK

The switches are used for the simulation of the sensors.



	Element	Quantity	Label		
	Contactor	5	S3 S5 S4 S2 S1	0 0 0 0 0	0 0 0 0 0
N	Neutral	2			
	Limit switch(single pole)	5			
T	L1	2			
R S T	3-Phase Supply	1			
M 3 ~	Three Phase Induction Motor	1			
	Lamp	5			

Fig 5 Partial Circuit

Now , we have to specify the power for the control circuit

Now for the sensor s1 and valve 1 relay

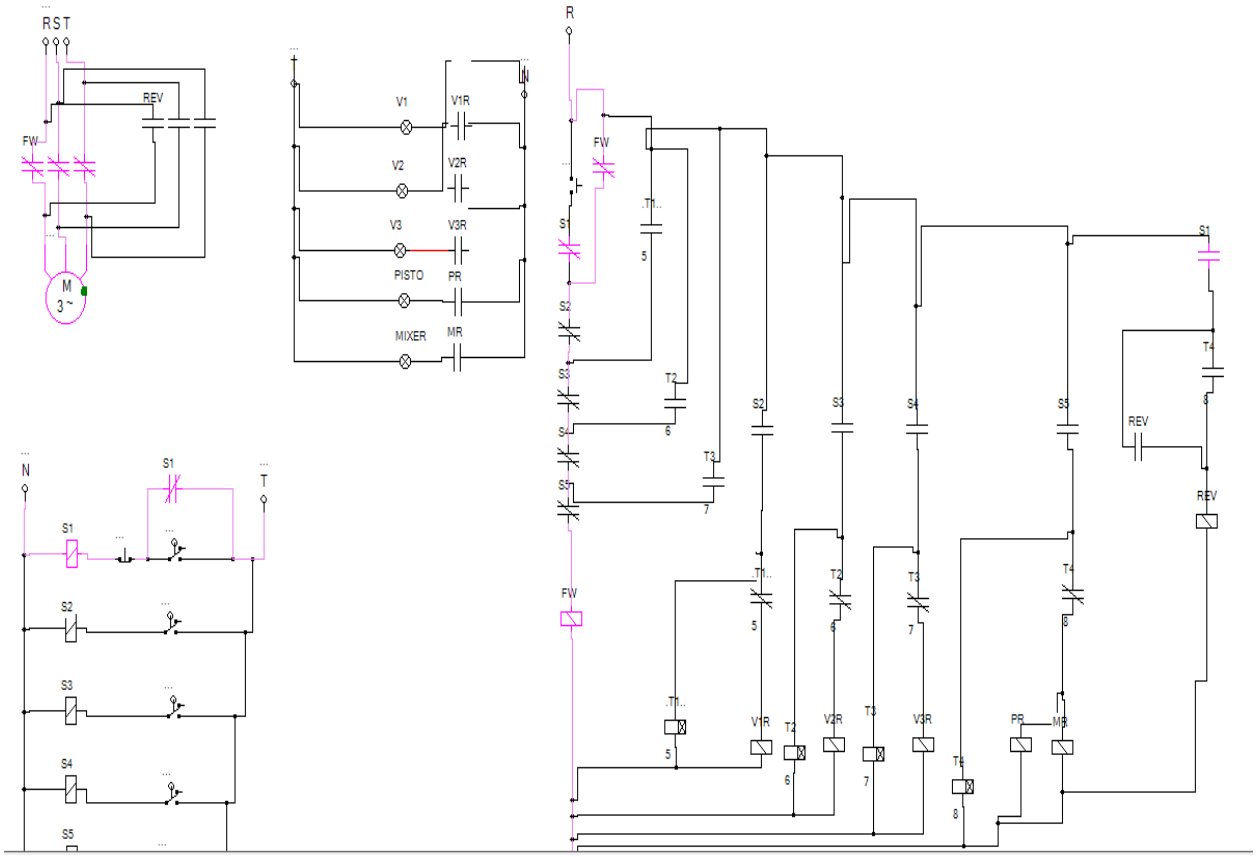


Fig 6 Sensor S1 Motor Started in Forward Direction

Sensor S1 and then press start

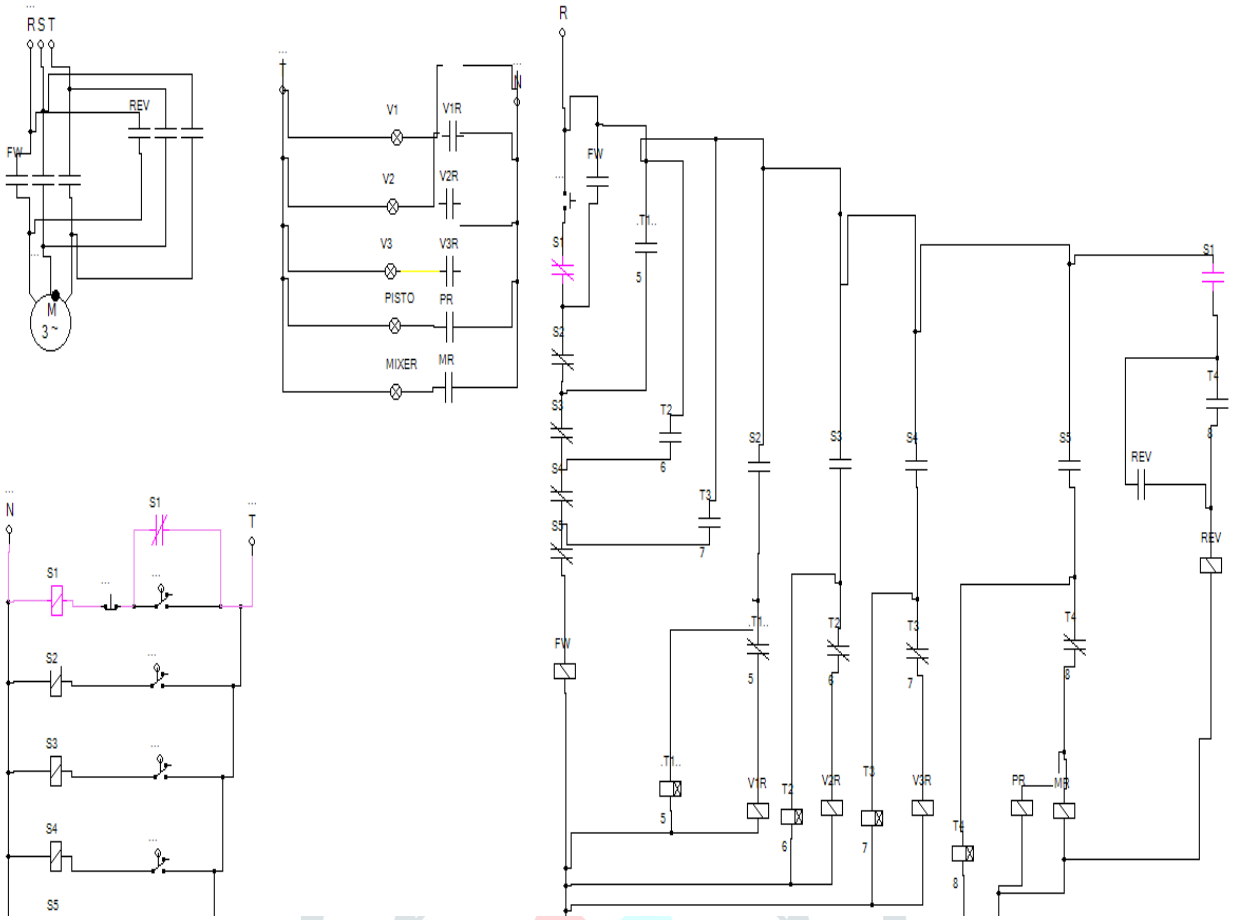


Fig 7 Sensor s2

Then we reach to sensor S2

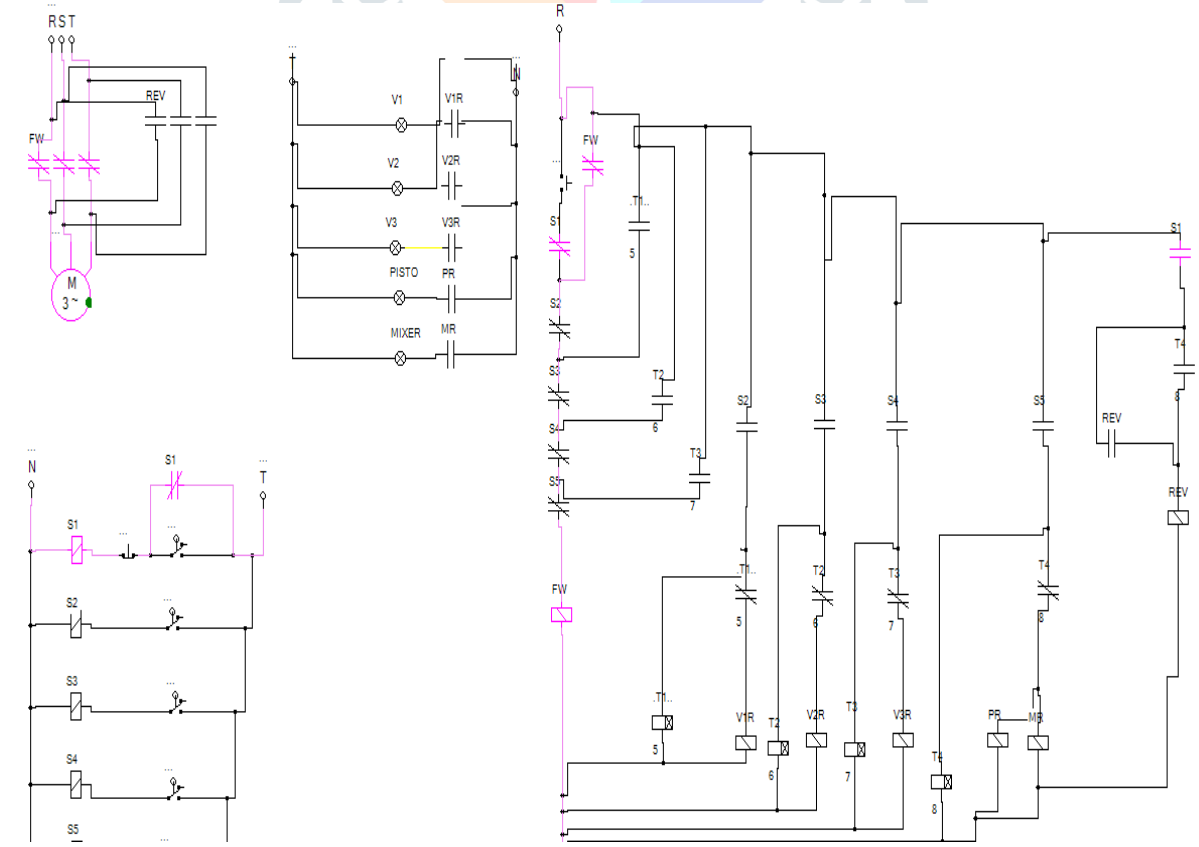


Fig 8 Motor Works in Reverse Mode

When we reach the sensor s3 then motor will operate for t2 time and after all sensors s4 ,s5 then the motor will operate in reverse direction and them moves to sensors s1-s5

	Element	Quantity	Label		
	Lamp	5			
	Contactor	12	REV MR PR V3R V2R V1R FW S5 S4 S3 S2 S1	4 1 1 1 1 1 4 1 1 1 1 2	0 0 0 0 0 0 0 1 1 1 1 1
R	L3	1			
	On-delay Time Relay	4	T4 T3 T2 .T1..	1 1 1 1	1 1 1 1
N	Neutral	3			
	Stop Button	1			
	Start Button	1			
	Limit switch(single pole)	5			
T	L1	2			
R S T	3-Phase Supply	1			
M 3 ~	Three Phase Induction Motor	1			

Fig 9 Components Diagram

4.1 Result Analysis

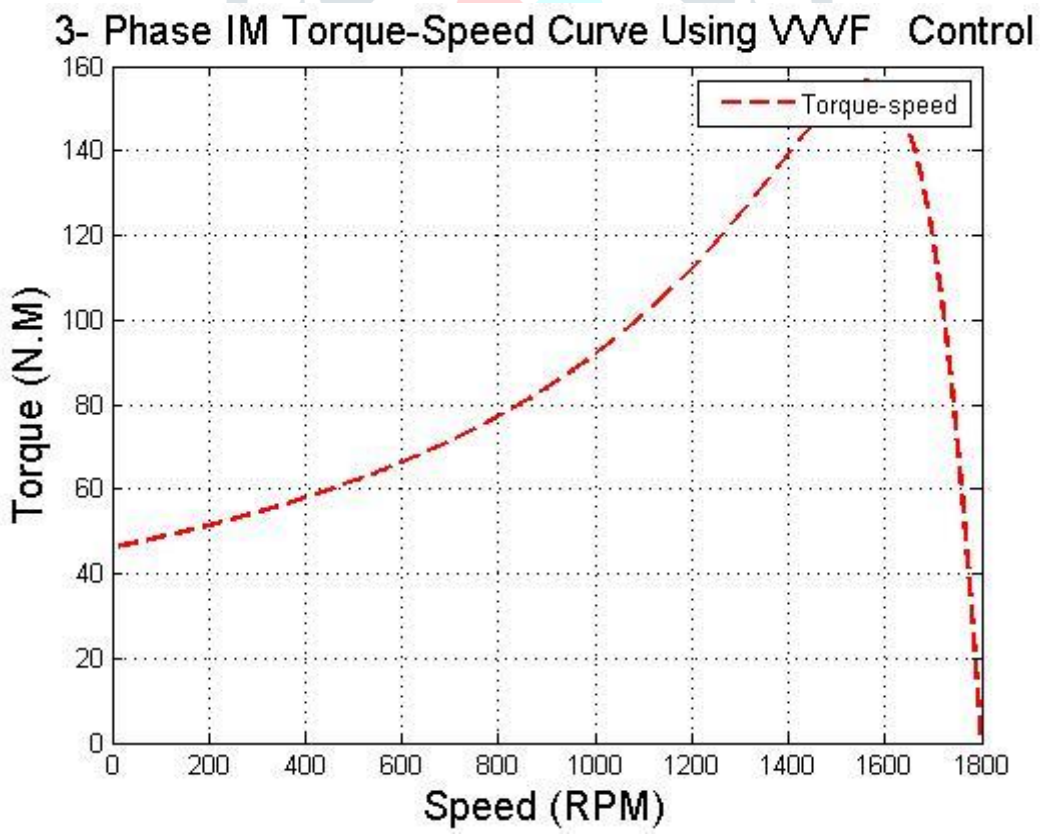


Fig 4.10 Result Case I

The result obtained with the case of f=30 , the resultant torque and slip values are as follows ,
Maximum Torque: 125.8252
Slip for Maximum Torque : 0.2420

The other settings are ,

Stator Resistance= 0.66 Ohm

Stator Reactance=1.14 Ohm

Rotor Resistance=0.38 Ohm

Rotor Reactance=1.71 Ohm

Magnetizing Reactance=33.2

Base Synchronous Speed= 1800 rpm

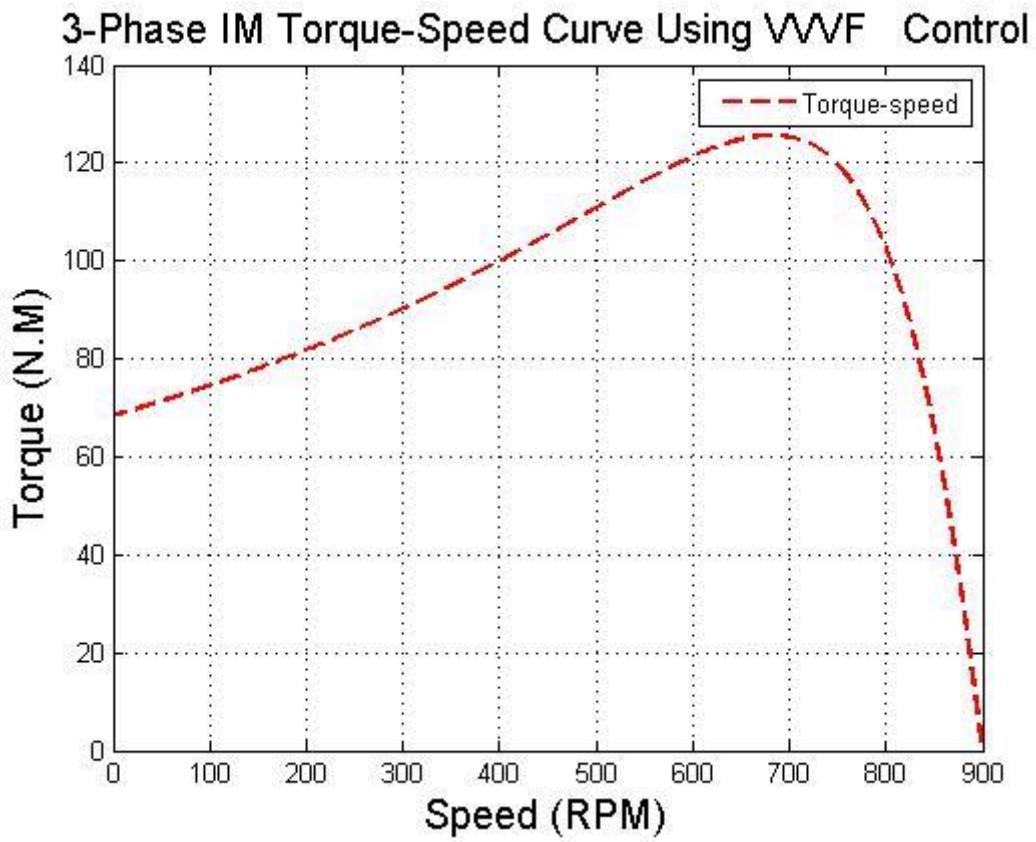


Fig 11 Result Case II

The result obtained with the case of f=60, the resultant torque and slip values are as follows ,
Maximum Torque: 156.5468
Slip for Maximum Torque: 0.1299

The other settings are,

Stator Resistance= 0.66 Ohm

Stator Reactance=1.14 Ohm

Rotor Resistance=0.38 Ohm

Rotor Reactance=1.71 Ohm

Magnetizing Reactance=33.2

Base Synchronous Speed= 1800 rpm

V. CONCLUSION

The proposed work simulates the Color Mixer simulation in EKTS and also analyses the working of the speed control using the various concepts including the VVVF Control for the three phase induction motor. The execution works in the proposition of the Color Mixer Machine which have the plan for beating the over-burden, the postulation center around the plan of the color mixer machine which can works in the forward and reverse way and utilizing the 3-phase induction motor. The stoops reproduction of the Color mixer machine is done on EKTS. Along with that the reproduction and the idea investigation is likewise done on the MATLAB where the speed control system of the 3-phase induction motor is additionally examined utilizing VVVF Control.

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