Pressure and Temperature Control using Embedded System with GSM

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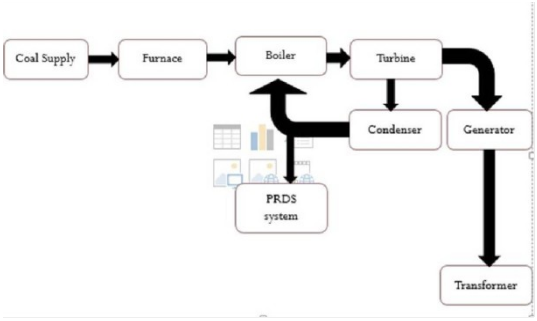
ABSTRACT: InThermalPowerPlant,auxiliarysteamplays animportantrole.Theauxiliarysteamistappedfromthemainsteam.Thepressurerequirementofauxiliarysteamisdifferentfromthatofmainsteam.Tocontrolandtomaintaintherequirementsoftheauxiliarysteampressurereductionandde-superheating(PRDS)systemisusedinMetturThermalPowerStation-2.ThePRDSsystemincludes30modulesofanalogunitstogivecontrolsignaltothe respectivedrives.Thecomplexitiesandfailuredue to thediscretecomponentsaremore.Theproposedpaper"REDUCED DE-SUPERHEATED SYSTEM BY USING MICROCONTROLLER WITH GSM“ isaimed to reducethe complexitieswhilecontrollingandmaintainingthe systemparameters.Inthispaperamicrocontrollerhasbeenusedto provide control signals.The accuracy and speed of control system increased the cost of system and reduces consequently.Thecontrollerinadditioncanprovidecontroloverleakageofsteaminworstcases.

KEYWORDS: Pressurereducingvalve,nozzles,HFOatomizing.

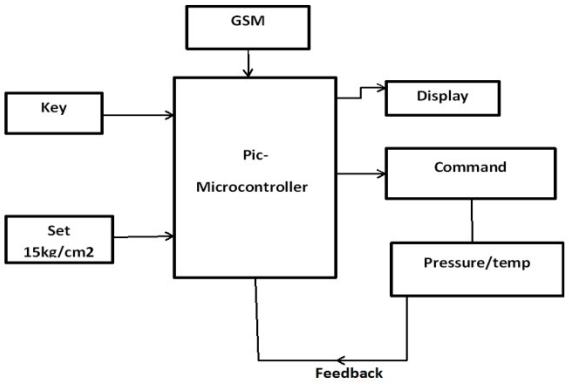
INTRODUCTION:

TheSteamPRDSisusedforSteamConditioningServicesforreductionof pressureand temperatureofsteam.Itis a combinationofControlValveforthepressurereductionpurposeandatomizingnozzlesthroughwhichwaterissprayed into steamforreducingthetemperature.Typicalapplicationsarein Boilersteam, Turbineby-pass,HRS(Heatrecovery steamGeneration),andtypicalProcessapplicationwhereteamtemperature andPressurearecritical.Normally steam willbeproducedintheBoilerwithhighpressureand temperatureanddependingontheprocessrequirement,pressure andtemperaturewillbereducedattheconsumptionpointattheplant.Thiswillhelptoreducetheenergylossesduring thetransmission.PRDSsystemsaredesignedtoreducethesteampressuretooperatingpressureandalsobringthe outletsteamtemperatureclosertothatofsaturation.Suitably designedpressurereducingvalveinstalledonsuperheated steamline,reducessteampressuretodesiredoperatingpressure.Duringthisprocessthesteamtemperaturealso reducesfollowingsuperheatedsteamcurve,howeverthedegreeofsuperheatremainsunaltered.Thesteamtemperature isreduced closeto saturationbyinjectingwaterintohighvelocitysteambycontrolledwaterflowthroughwatercontrol valve. Spraywater quantityrequired for the temperaturereduction of International Journal of Latest Trendsin EngineeringandTechnology(IJLTET).Thesteamiscontrolledby separatespraywatervalve.Thespraywateris injectedintothesteamwheresteamvelocityandturbulencearetheirhighest,whichgivesquickandefficient cooling.ForPRDScontrolsystem,therewillbeone Pressure loopandone temperatureloop.ExistingSystem:Inthis paper,thepressurereducedandvalvesarecontrolledusingintegratedcircuitsmanually [1].Thepressurereductionand de-superheatingsystemisusedforthecontrolandthemaintenanceoftheauxiliary steamparameters.Therearetwo controlloopstoachievethe requirementssteampressurecontrolwaterinjectioncontrol(temperature).Thesteam pressureatthemainsteamline is130Kg/sq.cm.Thepressurevalueis reducedtomeetthe requirementsoftheauxiliary steam.Thisisdoneby thepneumaticvalvecontrolaction.Thepressureafterthepressurecontrolvalveissensedand transmittedas4-20mAcurrentsignalby pressuretransmitter.Thesetsignalfromthecontrolboardisgivenasanother input tothePIcontroller.Whenthepressureishigherthantherequirementvalveopeningisreduced,whenit islowthe valveopeningisincreasedtomaintainapressureof15Kg/sq.cm.The“SelfPRDS”systemwheresteamiscutofffrom themainlineintoacommonbusthatcanbeutilizedbytheother unitsissubjectedtovariouslossessuchasvalveleakage,glandleakage,turbulenceandvibration.Thecommonfactorattributingtothisproblemisthehighpressure dropacrossthevalves.So themainaimofourprojectistoperformananalysisforevaluationandoptimizationof the systembyreducingthepressuregradually instagesinthemainlineofthePRDSsystemandtoindicatetheneedfor furtherresearchand recommendationsforperformancecomparisons,assessmentsand improvementindesignafter identifyingthepotentialareasof improvements.Duetotheimportanceof thepressure reducingandde-superheating systemtheattentionofthedesignershasbeenconcentratedonthisparticulartopic.

SYSTEMMODELAPPROACH:



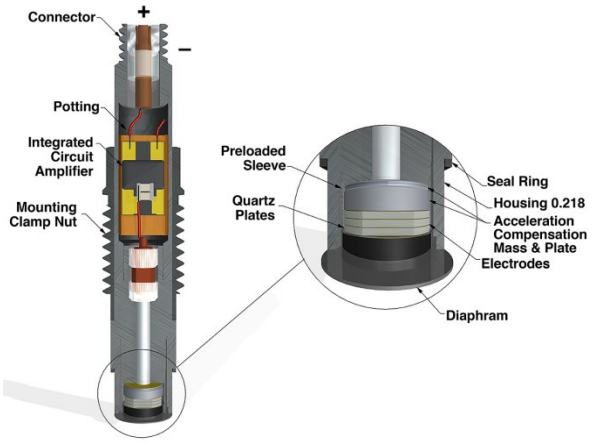
PicMicrocontroller:TheMicrocontrollerthathasbeenusedforthisprojectisfromPICseries.PICmicrocontrolleristhefirstRISC based microcontrolleron fabricatedin CMOS(complementarymetal oxidesemiconductor)that usesseparatebusforinstructionsanddata allowingsimultaneousaccessof programminganddatamemory.Themain advantageofCMOSandRISCcombinationislow powerconsumptionresultinginaverysmallchipsizewitha small pincount.ThemainadvantageofCMOSisthatit hasinimmunity tothanotherfabricationtechniques.DigitalToAnalogConverter:TheDAC0808 is an8-bitmonolithicdigitaltoanalogconverter(DAC)featuring afullscaleoutput currentsettlingtimeof150nswhiledissipatingonly33MWwith+5Vsupplies.Noreferencecurrent(IREF)trimming is requiredformostapplicationssincethefullscaleoutputcurrentistypically 1LSBof255IREF/256.Relative accuraciesofbetterthan+0.19%assure8-bitmonotonicityandlinearitywhilezeroleveloutputcurrentoflessthan 4MAprovides8-bitzeroaccuracyforIREF2mA.MicrocontrollerBoard



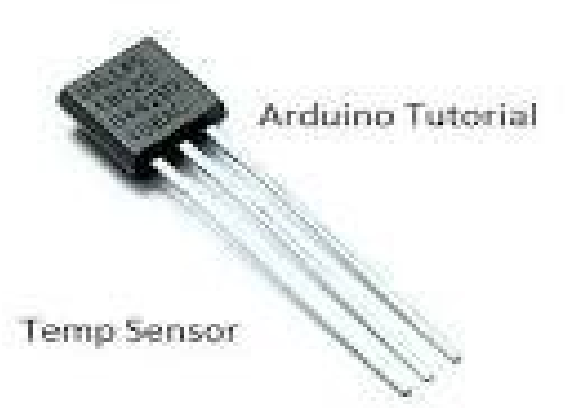
The referenceinputtothemicrocontrolleris givenbythekeyboardthroughpull-upresistors(p1.0-p1.4).Thepressure(p0.0-p0.7)andtemperature(p3.0-p3.7) valuesfromthefeedbackllooparegiventothecontrollerviathebus.Thecontrolsignalsfromthecontrollergivento thelatchandtotheDAC.TheControlleralsoprovidesthepr ocessthevaluestothe LCDdisplay(p1.5-p2.3).The ports(p2.4-p2.7)areusedfortheindicationof normalandworstconditions.Thepinnumber18 and19 arefordelay calculation.Herecrystaloscillatorisusedforthis purpose.Herethemicrocontrollerreceivesthetemperatureand pressureset values andthen themicrocontroller interpretsthevalues gives thattothelatches.Transformer: The potentialtransformerwillstepdownthepowersupply 230Vto 0-12Vlevel.Thenthesecondaryof transformerwillbe connectedtomicrobridge.Rectifier.Theadvantageofusingmicrobridgerectifierwillgivemaximumpeakvoltageas DC;costofthecircuitisreducedand reducesthespaceforbulky components.BridgeRectifier(W04):W04isasingle phasefullwavemicrobridgerectifier.Thismicrorectifierconvertsthegiven ACinputtoDCoutputwith4Acurrent. Itcanaccept400VACinputfortherectificationprocessand outputwillbe12VDC.Ithasoperatingtemperature rangefrom-55 deg.cto125 deg.candstoragetemperaturerangefrom-55 deg.cto150 deg.c.Itis moresuitablefor printedcircuitboard.ithasmoldedplasticcasesand solderplatedleads.Filter:Herecapacitoractsasafilter. GSM,theGlobalSystemforMobileCommunicationis a digital cellularcommunicationssystemswhichhasrapidly gainedworld-wide acceptance,althoughitwas initially developedinEurope.in this system the pressure level will be intimate to controller station.

GSM will active always the pressure level when increase the controller will send command to GSM. Then the message will send to operator and controller of the PRDS section.it is additional advantage of our project.This reporthas givenanoverviewofGSMis thefirstapproachatthe truePersonal Communication„Systems(PCS).TheSIMcardisanovel approach thatimplementsthepersonaland terminalmobility.Together withinternational roamingandsupportforvariousservicesGSMcomes closetofulfilling therequirements ofPCS.GSMisbeing usedforthe next generationofmobiletelecommunicationtechnology theUniversalMobile Telecommunication Systems(UMTS). The GSMnetwork Functions, system architectureandprotocolsarespreadoveralargenumberof GSM documents.

Pressure sensor is a device equipped with a pressure-sensitive element that measures the pressure of a gas or a liquid against a diaphragm made of stainless steel, silicon, etc., and converts the measured value into an electrical signal as an output.

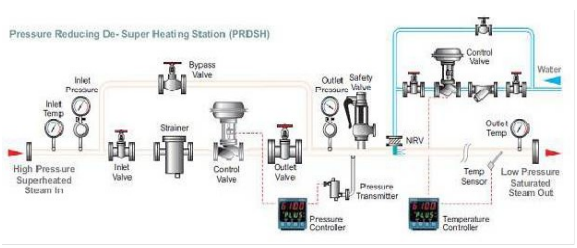


Thermistors are thermally sensitive resistors whose prime function is to exhibit a large, predictable and precise change in electrical resistance when subjected to a corresponding change in body temperature.



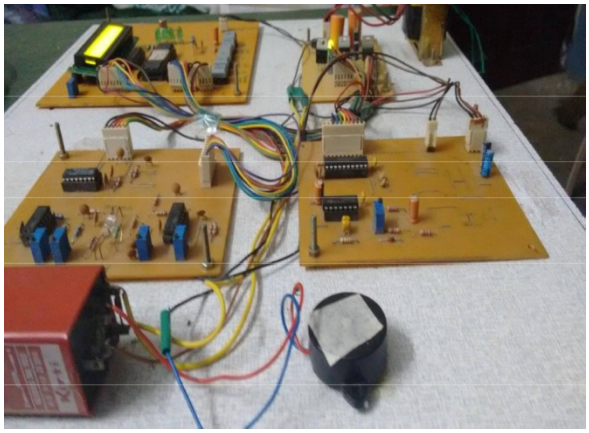
Negative Temperature Coefficient (NTC) thermistors exhibit a decrease in electrical resistance when subjected to an increase in body temperature and Positive Temperature Coefficient (PTC) thermistors exhibit an increase in electrical resistance when subjected to an increase in body temperature

SCHEMATICDIAGRAM:



Schematic diagram for pressure reduced de-superheating station in thermal power station the stream control isusingtheintegratedcircuit(*I.C)*.Bythismethodweareovercomingthedisadvantageofoldtechnologyusedinthe thermalpowerplant.Thisnewmethodgreatlyreducestheh uge reductionofhumaninteractionwiththethermalboiler. Thisismainlyusedtocontrolthepressureandtemperatureo fsteamforheatingtheboiler.Mainlyreducethewastage.

RESULT AND IMPLEMENTATION:



InthispaperthePressurereducedde-superheatedsteamsystemusingmicrocontrollerisused.I nfuture itispossibleto installthe microcontrollerbasedPRDSsystemintheThermalpower stationswhichmayreducethecomplexityduring controloperationandalsoreducethesizeof the system.Furtherthe systemcanbeexpandedfortheleakagecontrol also.FEATURESOF16F877A:High-performanceRISCCPU,Only35singlewordinstructiont olearn,Allsingle cycleinstructionsexceptforprogrambrancheswhicharet wocycles,Upto8Kx14 wordsofflashmemory,pinout compatibletothePIC16C73/74/76/, Interruptcapability(upto14internal/external).MemoryO rganization:Thereare threememoryblocksineachofthePIC16F877MUC'S.Th eprogrammemoryanddatamemoryhaveseparatebuses, sothatconcurrentaccesscanoccur.ProgramMemory Organization:PIC16F877deviceshavea13-bitprogramcounter capableofaddressing8K*14wordsofFLASH programmemory.Accessingalocationabovethephysical ly implemented addresswillcauseawraparoundoffuel.

DataMemory Organization:Thedatamemory ispartitionedintomultiplebankswhichcontainthegeneral purpose registersandthespecialfunctionsregisters.Bits RP1(STATUS<6)RPO (STATUS<5)arethebankselectedbits.Inthis paperweareducedthepressureusingmicrocontroller.F

ordemopurpose,wereducedthecontrolvalvewithhelpthe ledcircuit,feedbackbyusinganrelay circuit,thenwecansetanypressurerangeandreachedthere quiredpressurefor usingLCDdisplay,LEDindication(OK).

APPLICATION AREA:ATOMIZINGprocess,HFO(HeavyFuelOil)and HEATINGprocess.

CONCLUSION:

ThemicrocontrollerbasedPRDSsystemmakesthecontrol easierandinadditionitcanbeabletodisplay theprocess valueandprovidesindicationsduring abnormalities.Theprototypeof thisdigitalizedPRDS systemisdesignedand testedforsmallloadsandthenthesystemseemstobefastera ndnoappreciableerrorshavebeendetected.Thedesign ismuchsimplerandalso economical.Infuture itispossibletoinstallthismicrocontrollerbasedPRDSsyst eminthe thermalpowerstationswhichmay reducethecomplexityduringcontroloperationsandalsore duce thesizeofthe system.Furtherthesystemcanbeexpandedfortheleakagec ontrolalso.

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