

Overview of Controlling and Monitoring of Extrusion through Android System

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ABSTRACT

The process in which the material is melted by external heat i.e. external heater and conveyed forward by a screw to the opening of the die, which gives the shape of the required product, is called as Extrusion. Extrusion process is a continuous process by which many products like Films, Raffia tapes, Pipes, Sheets, Mono filaments, Fibre and Filaments can be manufactured. Here the main advantage of extrusion process is to reuse plastic by grinding to form granules farther again used for extrusion process. The project uses a centralized microcontroller which is programmed to receive the input signal of multiple sensors of the line. Once the controller receives this signal, it generates an output that drives a relay for operating the Screw motor and other circuitry. An Android mobile operating system is used for interfacing of the microcontroller to control the parameters of the field. The Hopper sensor senses the level of material, screw motor turn on and off, set point of heater are interfaced to the control unit. This signal is sensed to mobile handset which provides graphical interface. An application should be installed on android mobile handset to control various Electrical appliances. User can send commands using that application. Wireless controlling technique used in this project is Wi-Fi. This Wi-Fi device is connected to the circuit which sends code for respective command sent by user. Then the respective device connected to the circuit will be turned on or off depending on the command given.

Keywords:- Extrusion, Android Smartphone.

I. INTRODUCTION

Extrusion is a process used to create objects of a fixed cross-sectional profile. A material is pushed or drawn through a die of the desired cross-section. The two main advantages of this process over other manufacturing processes are its ability to create very complex cross-sections, and to work materials that are brittle. In general, extrusion is used to produce cylindrical bars or hollow tubes or for the starting stock for drawn rod, cold extrusion or forged products. Most metals are hot extruded due to large amount of forces required in extrusion. Complex shape can be extruded from the more readily extrudable metals such as aluminium.

In order to produce satisfactory extrudate it is necessary to apply heat to the granules in order to soften them and make the resulting melt capable of flow under some pressure. This is carried out rotated in the barrel by means of gear box and variable screw drive or Eddy current motor.

Therefore the screw barrel has following functions: pumping, Heating, Mixing, Pressurizing, In order to make each function as effective as possible it is normal practice to divide the screw into 3 zones: feed zone at hopper end, compression zone (transition) at the middle, melt zone (melting zone) at the die end.

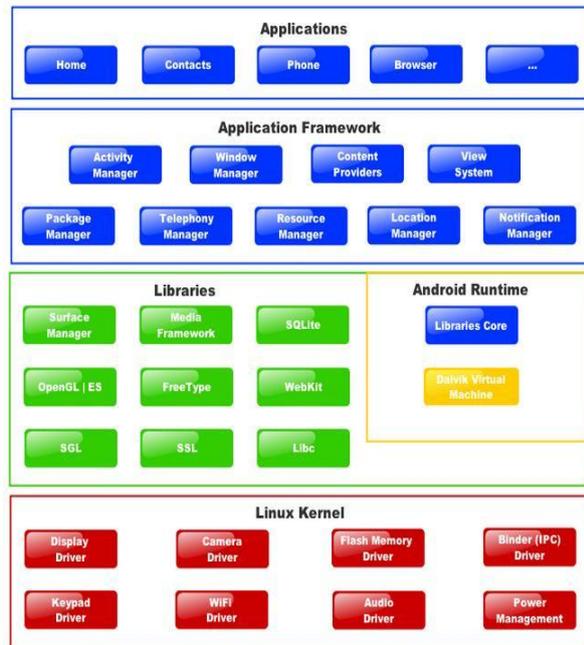
The function of the feed zone is to collect granules from the feed hopper and transport (pump) them up the screw channel. At the same time the granules should begin to heat up and compact and build up pressure as they advance towards screw tip (die end). For efficient pumping the granules must not be allowed to lie in the screw channel. They must therefore show high degree of slippage on the screw channel surface and a low degree of slippage on the barrel.

The main objective of this project work is to develop android based Extrusion system capable of controlling many electrical appliances in an industrial field using android platform with a mobile handset, where data transmission is carried wirelessly.

II. ARCHITECTURE OF ANDROID

In this section an overview of the Android platform and the components of an Android application are discussed.

The Android platform is composed of 5 layers:



Linux Kernel

The basic layer is the Linux kernel. The android os is present at top of Linux kernel. The term kernel means core of any operating system. Android at its core is Linux. but we can't run any Linux package on android. It is totally different os.it interacts with the hardware and it contains all essential hardware driver. For example, consider the Bluetooth function. All devices have Bluetooth hardware in it. Therefore the kernel must include a Bluetooth driver to communicate with the Bluetooth hardware. The Linux kernel also acts as an abstraction layer between the hardware and other software layers. As the Android is built on a most popular and proven foundation, the porting of Android to variety of hardware became a relatively painless task. Libraries-The next layer is the Android's native libraries. It is this layer that enables the device to handle different types of data. These libraries are written in c or c++ language and are specific for a particular hardware. Android runtime- Android Runtime consists of Dalvik Virtual machine and Core Java libraries.

1-Dalvik Virtual Machine- It is a type of JVM used in android devices to run apps and is optimized for low processing power and low memory environments. Unlike the JVM, the Dalvik Virtual Machine doesn't run .class files, instead it runs .dex files. .dex files are built from .class file at the time of compilation and provides higher efficiency in low resource environments. The Dalvik VM allows multiple instance of Virtual machine to be created simultaneously providing security, isolation, memory management and threading support.

2)ART- Google has introduced a new virtual machine known as ART (Android Runtime) in their newer releases of Android. In Lollipop, the Dalvik Virtual Machine is completely replaced by ART. ART has many advantages over Dalvik VM such as AOT (Ahead of Time) compilation and improved garbage collection which boost the performance of apps significantly. Core Java Libraries-These are different from Java SE and Java ME libraries. However these libraries provides most of the functionalities defined in the Java SE libraries

Application framework- These are the blocks that our applications directly interacts with. These programs manage the basic functions of phone like resource management, voice call management etc. As a developer, you just consider these are some basic tools with which we are building our applications.

Important blocks of Application framework are:

Activity Manager: Manages the activity life cycle of applications

Content Providers: Manage the data sharing between applications

Telephony Manager: Manages all voice calls. We use telephony manager if we want to access voice calls in our application.

Location Manager: Location management, using GPS or cell tower

Resource Manager: Manage the various types of resources we use in our Application

Applications

Applications are the top layer in the Android architecture and this is where our applications are going to fit into. Several standard applications come pre-installed with every device, such as:

- SMS client app
- Dialler
- Web browser

- Contact manager

As a developer we are able to write an app which replaces any existing system app. That is, you are not limited in accessing any particular feature. You are practically limitless and can do whatever you want to do with the android (as long as the users of your app permit it). Thus Android is opening endless opportunities to the developer.

III. EXTRUSION

In the extrusion of plastics, raw compound material in the form of nurdles (small beads, often called resin in the industry) is gravity fed from a top mounted hopper into the barrel of the extruder. Additives such as colorants and UV inhibitors (in either liquid or pellet form) are often used and can be mixed into the resin prior to arriving at the hopper. The process has much in common with plastic injection moulding from the point of the extruder technology though it differs in that it is usually a continuous process. While pultrusion can offer many similar profiles in continuous lengths, usually with added reinforcing, this is achieved by pulling the finished product out of a die instead of extruding the polymer melt through a die.

The material enters through the feed throat (an opening near the rear of the barrel) and comes into contact with the screw. The rotating screw (normally turning at up to 120 rpm) forces the plastic beads forward into the heated barrel. The desired extrusion temperature is rarely equal to the set temperature of the barrel due to viscous heating and other effects. In most processes, a heating profile is set for the barrel in which three or more independent PID controlled heater zones gradually increase the temperature of the barrel from the rear (where the plastic enters) to the front. This allows the plastic beads to melt gradually as they are pushed through the barrel and lowers the risk of overheating which may cause degradation in the polymer.

Extra heat is contributed by the intense pressure and friction taking place inside the barrel. In fact, if an extrusion line is running certain materials fast enough, the heaters can be shut off and the melt temperature maintained by pressure and friction alone inside the barrel. In most extruders, cooling fans are present to keep the temperature below a set value if too much heat is generated. If forced air cooling proves insufficient then cast-in cooling jackets are employed. At the front of the barrel, the molten plastic leaves the screw and

travels through a screen pack to remove any contaminants in the melt. The screens are reinforced by a breaker plate (a thick metal puck with many holes drilled through it) since the pressure at this point can exceed 5000 psi (34 MPa). The screen pack/breaker plate assembly also serves to create back pressure in the barrel. Back pressure is required for uniform melting and proper mixing of the polymer, and how much pressure is generated can be 'tweaked' by varying screen pack composition (the number of screens, their wire weave size, and other parameters). This breaker plate and screen pack combination also does the function of converting "rotational memory" of the molten plastic into "longitudinal memory".

After passing through the breaker plate molten plastic enters the die. The die is what gives the final product its profile and must be designed so that the molten plastic evenly flows from a cylindrical profile, to the product's profile shape. Uneven flow at this stage can produce a product with unwanted residual stresses at certain points in the profile which can cause warping upon cooling. Almost any shape imaginable can be created so long as it is a continuous profile. The product must now be cooled and this is usually achieved by pulling the extrudate through a water bath. Plastics are very good thermal insulators and are therefore difficult to cool quickly. Compared with steel, plastic conducts its heat away 2000 times more slowly. In a tube or pipe extrusion line, a sealed water bath is acted upon by a carefully controlled vacuum to keep the newly formed and still molten tube or pipe from collapsing. For products such as plastic sheeting, the cooling is achieved by pulling through a set of cooling rolls. For films and very thin sheeting, air cooling can be effective as an initial cooling stage, as in blown film extrusion. Plastic extruders are also extensively used to reprocess recycled plastic waste or other raw materials after cleaning, sorting and/or blending. This material is commonly extruded into filaments suitable for chopping into the bead or pellet stock to use as a precursor for further processing

IV. SYSTEM DESIGN

Extrusion is a process which create objects of a fixed cross sectional area here we are using hopper for inserting material in screw which is rotating with the help of motor and surrounded by heaters for melting material. the heaters are set to melting point of material further it goes through die to give it proper shape. Here we are using hopper sensor, heaters,

thermocouple, motor rpm etc parameter which are set to a proper set point. These all operations centralized to a microcontroller which is programmed to receive the input signal of multiple sensors, thermocouple, heaters, encoder etc of the field line. Once the controller receives this signal, it generates an output that drives a relay for operating the Screw motor and other circuitry which provides automatic control action on site (automatic mode).

An ANDROID smart phone mobile operating system is interfaced with the microcontroller to control the parameters of the field. (The Temperature sensing arrangement is made by using thermocouple. Connections from the thermocouple are interfaced to the control unit. This signal is sent to mobile handset

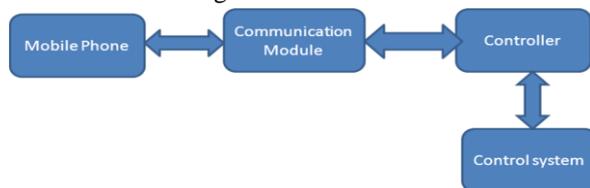


Fig. 1: Functional diagram of Automatic Extrusion system.

System design of android based automatic Extrusion system includes hardware and software sections interfaced together using wireless communication.

In this work we are using sensors, thermocouples, heaters, temperature controller etc with a controller which is acting as a centralised controller, wi-fi transceiver module and a mobile handset. Here we are going to give the command to the hardware parts through mobile via controller the controller will receive the command signal from mobile and gives to the analog to digital converter of the microcontroller to generate the digital signal. A command issued by the user through touching the programmed switch and it will be digitized and compared with the digitized commands already stored in the internal memory of IC. When a match is received, microcontroller status will be updated accordingly. The microcontroller in turn will generate a specific data pertaining to a given appliance and command which will transmitted through wireless channel using particular mobile handset.

This project work is aimed to develop an automated system capable of controlling operation of various devices placed in the field using android commands, so that any user or people with disabilities

and seniors can handle, simply, such devices with secure authentication. The architecture developed for automation includes transmitter and receiver module, for input android enabled mobile phone is used which will capture and transmit control signal. Microcontroller unit is used to control every operation of electric appliances. Intelligent automation system is an integrated system to facilitate user with an easy to use automatic Extrusion system that can be fully operated based on android commands. The system is constructed in a way that is easy to install, configure, run, and maintain.

V. CONCLUSIONS

This paper shoes that by use of android mobile we can monitor and control different parameters of line. Due to this we can increase the productivity

As well as reduce mans workload. Time required for controlling parameters is very less. Controlling and monitoring of parameters depends upon command by controller as mobile handset can be operated till certain higher temperatures, it would work continuously.

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