KAJIAN GETAH UNTUK KEGUNAAN INDUSTRI

Malaysia merupakan antara negara pengeluar utama getah asli di dunia. Selain dari pada mengeluarkan getah asli, Malaysia juga telah berjaya menghasilkan produk-produk bermutu daripada getah seperti sarung tangan, tayar dan sebagainya. Menurut ASTM D1566-90 (1990), getah ditakrifkan sebagai bahan yang berupaya pulih apabila tekanan dikenakan kepadanya. Getah tidak larut tetapi boleh berubah apabila dicampurkan ke dalam pelarut seperti benzene dan metil etil keton.

Getah ini boleh dibahagikan kepada dua jenis iaitu getah asli dan getah sintetik (Hanafi 2004). Elastomer yang utama adalah getah asli. Getah asli merupakan suatu polimer hidrokarbon linear yang terdiri dari unit-unit isoprena (Ibrahim et al. 1995). Ia terdiri daripada unit-unit ulangan isoprena yang disusun secara kepala ke ekor (Brydson 1978). Getah asli (NR) diperolehi dalam bentuk cecair likat yang dikenali sebagai lateks dan struktur rantaian polimernya ialah cis-1,4 poliisoprena (Mustaffa 1991). Cis-1,4 poliisoprena ialah satu rantaian panjang yang mempunyai berat molekul purata lebih kurang 5 x 10^5 g/mol. Lateks atau cis-1,4 poliisoprena dengan kumpulan sisi –CH3- ditempatkan hanya pada satu bahagian rantai polimer. Indek 1,4 menunjukkan unit-unit kimia yang berulangan pada atom karbon yang pertama dan keempat ikatan kovalen rantai polimer.

Getah asli termoplastik (TPNR) merupakan bahan termoplastik yang disediakan melalui pengadunan getah asli dan bahan poliolefin. Terdapat dua kumpulan bahan-bahan plastik iaitu termoplastik dan termoset. Kedua-dua jenis plastik ini mempunyai sifat-sifat yang istimewa dan sering digunakan secara meluas dalam bidang industri. Bahan-bahan termoplastik boleh dilentur, dilembutkan dan boleh diproses berulang kali dengan mengenakan proses pemanasan dan tekanan. Daya antara rantaian molekul ini adalah daya van der waals yang lemah. Oleh itu, dengan mudahnya haba akan melemahkan daya di antara molekul dan menyebabkan bahan termoplastik menjadi lembut semula. Getah asli termoplastik (TPNR) disediakan dengan pengadunan getah asli dengan poliolefin seperti polipropena (PP) dan polietilina (PE) (Ibrahim et al. 1995). Para penyelidik banyak melakukan penyelidikan bagi getah asli termoplastik dengan pelbagai getah asli dan poliolefin seperti NR/HDPE, NR/LDPE dan NR/PP (Sahrim et al. 1994). Mengikut kajian yang telah dijalankan oleh Sahrim et al. (1994) mendapati bahawa sifat-sifat mekanik yang baik dapat dihasilkan dengan komposisi NR/HDPE: 60/40. Getah asli termoplastik dijangka dapat bersaing dalam pasaran getah kerana getah asli termoplastik mempunyai banyak kelebihan seperti (Elliot 1987):

(i)Kos pengeluaran yang rendah berbanding getah pemvulkanan.
(ii)Mempunyai kerintangan terhadap larutan asid, bes dan garam.
(iii)Harga yang lebih rendah berbanding poliuretana.
(iv)Bahan serpihan yang boleh diproses semula.
(v)Mempunyai kebolehan untuk melentur pada suhu rendah

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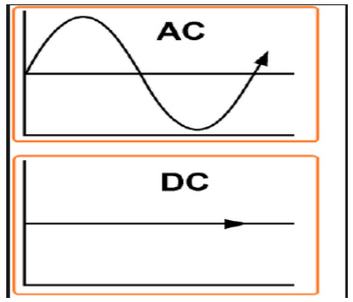
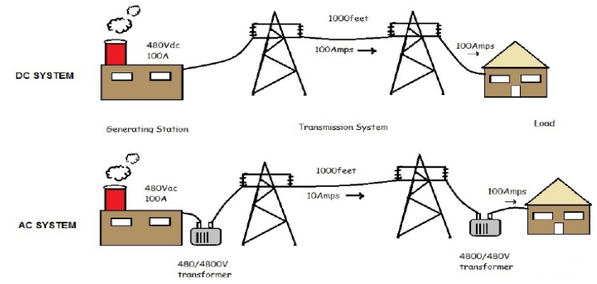
Advantages of AC Power over DC Power





We certainly have heard the term AC and DC power in everyday life where it is often associated with electricity but we may not know it in depth. If we randomly ask a layman about electricity, the person would probably say it is the power of magic that allows the lights to be turned on as well as makes a personal computer works. And if we ask randomly what is the AC power and DC power, the person may not all be able to answer correctly or perhaps he or she does not want to know about it at all.

Before going further about what is the AC power and DC power, let's go to the introduction first. Basically, there are two main sources of power in our daily lives namely DC power and AC power. Both of them have its own advantages and disadvantages depending on the circumstances and situations. But, did you know that a resource which is used in most of the equipment that we use every day come from which source? DC power or AC power? In fact, most of the equipment that we use daily at homes and offices commonly use AC power electricity as a main power source.

AC stands for alternating current, it is a form of electrical current that flows back and forth direction, unlike direct current (DC), which forms a permanent trend. The usual waveform of an AC current is a sine wave, as it produces a form of the most efficient electricity transmission. However, in certain applications different waveforms are used, such as a triangular waveform or a square wave. Generally, the AC refers to the form of electrical energy that is delivered to homes and businesses. However, audio and radio signals carried by the electrical wires are also examples of alternating current. AC electricity is measured according to its cycles, with one complete cycle being counted each time a given current travels in one direction and then doubles back on itself. An electrical current is able to complete many cycles per second, and is then given its frequency rating based on that number. That is why AC power commonly used in most part of our lives. Hertz is the unit for measuring an electrical cycle. The typical frequency in Malaysia is 50 Hertz (Hz), which indicates that the current is performing 60 cycles per second.

Most of the electricity consumed and produced use the AC as an energy source because AC offers many advantages over DC. One of them is the AC can be produced at high voltage, but DC cannot be produced at high voltage since the sparking which starts the commutator at high voltage will cause the commutator gets damaged. Besides that, high voltages AC generator are much easier to use and cheaper than DC generators of the same range. It is because there is no commutator in the AC generator which is costly and contains sensitive part which is prone to damage. AC can be stepped up or stepped down with a static device called transformer. When a voltage is stepped up, the small value of current will be produced. This small current produces less heat and can be transmitted through just a thin conductor. Thus it is possible to transmit AC at high voltages. This reduces the size of conductor, transmission losses and also increases transmission efficiency. At the receiving station, voltages can also be stepped down to the desired value by using step down transformer. This is the most important reason for generating and using AC as electrical energy. In conclusion, whether AC or DC power, both of them are very useful throughout our life. Without them, it is impossible for us to turn on the PC or even light up the bulb.

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Introduction To IP Addressing

In order to allow global communications among all devices in the Internet, the identifier is used at the network layer for delivery from host to host. It is identical to the telephone system which the telephone numbers consist of the country code and area code as part of the identifying scheme. The identifier in the network layer is called Internet address or IP address with 32-bit address (IPv4). IP addresses are unique in which each address defines one and only one connection to the internet. IP addresses are also universal where the addressing scheme must be accepted by any hosts connected to the internet. IP address is also known as logical address.

IPv4 consists of 32-bit address which means it can support to 2^{32} devices (4,294,967,296) in the world. However, almost 600 million are reserved and cannot be used for public routing [2]. The addresses are allocated to countries by the Internet Assigned Numbers Authority (IANA) via the Regional Internet Registries (RIRs) [2] and we can clearly observe via https://en.wikipedia.org/wiki/List_of_countries_by_IPv4_address_allocation. Some addresses are shown in Table 1.

Table 1

Rank	Country or entity	IP addresses[3]	%	Population (mostly 2012)[4]	IP addresses per 1000
	World	4,294,967,296	100.0	7,021,836,029	611.66
1	United States	1,541,605,760	35.9	313,847,465	4,911.96
	Bogons	875,310,464	20.4		
2	China	330,321,408	7.7	1,343,239,923	245.91
3	Japan	202,183,168	4.7	127,368,088	1,587.39
4	United Kingdom	123,500,144	2.9	63,047,162	1,958.85
5	Germany	118,132,104	2.8	81,305,856	1,452.93
6	Korea, South	112,239,104	2.6	48,860,500	2,297.13
39	New Zealand	6,954,496	0.2	4,327,944	1,606.88
40	Malaysia	6,322,432	0.1	29,179,952	216.67
41	Ireland	5,963,280	0.1	4,722,028	1,262.86

We can get information regarding to our IP address by typing 'ipconfig/all' in Command Prompt as shown in Figure 1. Make sure your computer is connected to the Internet before you run the prompt. As shown in Figure 1, apart from getting an IP address of your computer, you can also know the Physical Address of your computer and other information. Physical address or MAC Address is an Ethernet address which uniquely identifies computers and interfaces. It is burned into Read-Only Memory (ROM) in the Network Interface Card (NIC). MAC address consists of 48-bits and is expressed as 12 hexadecimal digits, such as 0000.0c12.ab89 or 00-00-0c-12-ab-89. Figure 2 shows the division of MAC address into two parts; the first six hexadecimal digits are the manufacturer or vendor identifier and the remaining six hexadecimal digits represent the serial number or other value administered by the manufacturer. MAC address works at Data Link Layer in OSI model.

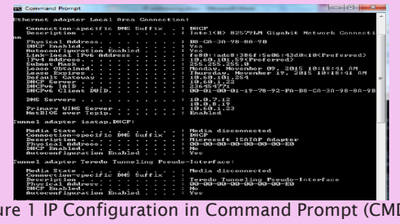

Figure 1 IP Configuration in Command Prompt (CMD)

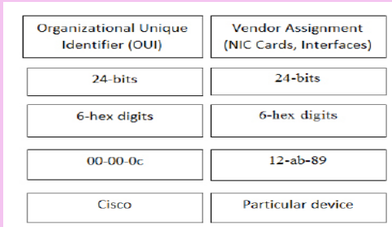

Figure 2: MAC Address

Compared to MAC address, IP address works at Network Layer in OSI model. When we deal with the internet, we refer to the TCP/IP model instead of OSI model. However, IP address is in the same layer for both models but with different name, Network layer in OSI model, Internet layer in TCP/IP model. The differences between TCP/IP and OSI model is shown in Table 2.

Table 2 Differences between TCP/IP and OSI model

OSI Reference Model	TCP/IP Refernce Model
OSI Model: 7 Application, 6 Presentation, 5 Session (Application Layers); 4 Transport, 3 Network, 2 Data Link, 1 Physical (Data Flow Layers)	**TCP/IP Model**: Application, Transport, Internet, Network Access (Protocols, Networks)
7 architectural layers	4 architectural layers
General model	Specific model for internet
Protocol independent	Protocol dependent
Separate presentation and session layers	Combines presentation and session layers into application layer
Separate physical and data link layers	Combines physical and data link layer into network access layer

IP addresses are expressed in decimal numbers such as 10.8.240.13. IP addresses are categorized into five classes as depicted in Table 3. For the public addressing scheme, only Class A, B and C are used. Class D is utilized for multicast network while Class E is reserved for future or experimental purposes. We can identify the class of our IP address based on the first value by referring to Table 3. For instance, my IP address as shown in Figure 1 is 10.60.101.59. Because my IP address begins with 10, it is in decimal range of 0 to 127 which means the IP address is in Class A. Identifying the classes are important to develop a local network for assigning devices in the network. However, this is not discussed here.

Table 3 IP Address Classes

Class	Starts with (MSB) in the First octer	Binary range	Decimal value range
A	0	00000000-01111111	0-127
B	10	10000000-10111111	128-191
C	110	11000000-11011111	192-223
D	1110	11100000-11101111	224-239
E	1111	11110000-11111111	240-255

Nowadays, IP addresses are running out due to the large amount of networks that have been allocated. The problem we face today, more than one computer and smartphone are used for one home. Even, the electrical and mechanical appliances are being enabled for Internet access these days. Thus, some addresses that had been blocked for reserving special purposes before, are currently used for private networking. Followings are the ranges and the amount of private IPs:

10.0.0.0-10.255.255.255	16,777,216
172.16.0.0-172.31.255.255	1,048,576
192.168.0.0-192.168.255.255	65,536

Private IP addresses are also known as 'Non-Routable Addresses'. Do not be surprised if these private IP addresses can be the same as your neighbors'. Routers recognize the private address belongs to our network and never forwards the packet to other networks if it is not necessary. However, we still require a real address from the router. Network Address Translation (NAT) is performed by a router to change private IP address to real IP address if the packet needs to be sent to the internet.

In the future, the use of Internet might be widely used by more than 4.2 billion of devices. In order to overcome this problem, IPv6 has been defined and developed. IPv6 uses 128-bits rather than the 32-bits currently used in IPv4, which means it can support number of devices as much as 2^{128}. Compared to IPv4, IPv6 represents its number by using hexadecimal numbers. For further reading, feel free to check the link https://en.wikipedia.org/wiki/IPv6_deployment.

References:
[1]www.ciscopress.com
[2]https://en.wikipedia.org/wiki/List_of_countries_by_IPv4_address_allocation
[3]https://en.wikipedia.org/wiki/IPv6_deployment

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