Chapter 10

THE MEDIUM'S AFFECTS CAUSED BY THE HIGH VOLTAGE EQUIPMENTS.

The high voltage equipment that causes the highest radio interference is the power line, the power linecan be divided into two groups according to the high voltage rating such as:

1. Transmission line is the power line that carries the electrical power from 69 kv. and higher.

2. Feeder orDistribution line is the power line that carries the electrical power below 69 kv. usually at 33 kv. or 12 kv. orlower.

All power line interference above 15 MHz is determined to have spark or microspark origin.

Distribution Lines

Sparks on power lines usually occur when the physical position of at least onemetal component does not meet interference requirements for adequate bonding or adequate insulation to an other component. On pin-type lines using obsolete weather-proof wire for either conductors or ties, husky sparks will eventually occur at 23.8 kv and above. The remedy is bare wire,or perhaps a suitable modern covering. A 13.8 kv line using both polyethelene covered

conductor and tie wires on standard pin insulators showed no radio interference in rain or fair weather after nine years of service.

with line voltage above 20 kv, loose bare tie wires usually cause microparks between porcelain and metal. Few coronas or microsparks occur at pin-hole if insulators are tight on pins and insulator design incorporated good conduction between pin and porcelain. A single component cap or a bonded multipart cap on a post-type insulator for distribution lines gives low interference intensities. This solution also applied to transmission lines through 69 kv.

10.2 Transmission Line

Some modern lines through 115 kv. have been built to have no sparks and to have corona levels at 1 MHz below 10 Mv/m GP, which a 6-kHz bandwidth. These values are for measurements made mid-span near the center of the line, or the maximum of the lateral profile, and same 35 feet below conductors.

In MEA system, a substation composes of both transmission lines and distribution lines.

The transmission line is the bare wire, with the cross section area about 795 MCM, single line per phase

or two lines perphase as the bundle conductor: From fig3, the transmission lines are the incomming lines of the substation. The causes of the radio interference of the transmission line can be divided into 3 types such as.

1. The unbalance of load of the transmission line, this usually occures when one of the three phases is used for supplying many arc welding equipments which the other two phases are supplying hight loads. But, this is the temporary case,it occures when the MEA supplies the electrical power to the large construction areas,when the construction is finished this affect is also cancelled. The affect of the unbalance load can be discribed theoritically in this manner.

a) when there is current (I) flows in a wire conductor as in fig.21

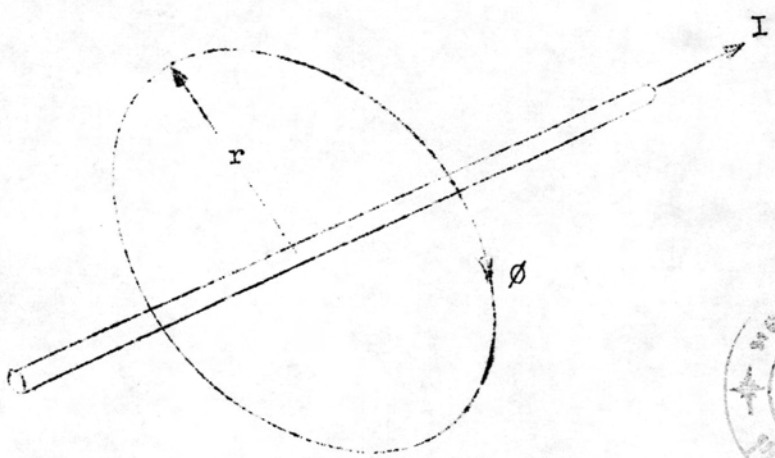

Fig.21

Magnetic flux around a conductor.

It will generate the magnetic flux (ø) around that conductor, the flux density (B) is depend on the load or current that flows in the conductor, when the load of the transmission system is raised to the high value such as in the "peak load" interval, usually at 6 pm, to 8 pm, the flux density (B) and the radius of flux (r) from the center increase, this will cause interference with the electro-magnetic wave of the communication signal.

b) the example of the communication interference can be illustrated in this manner.

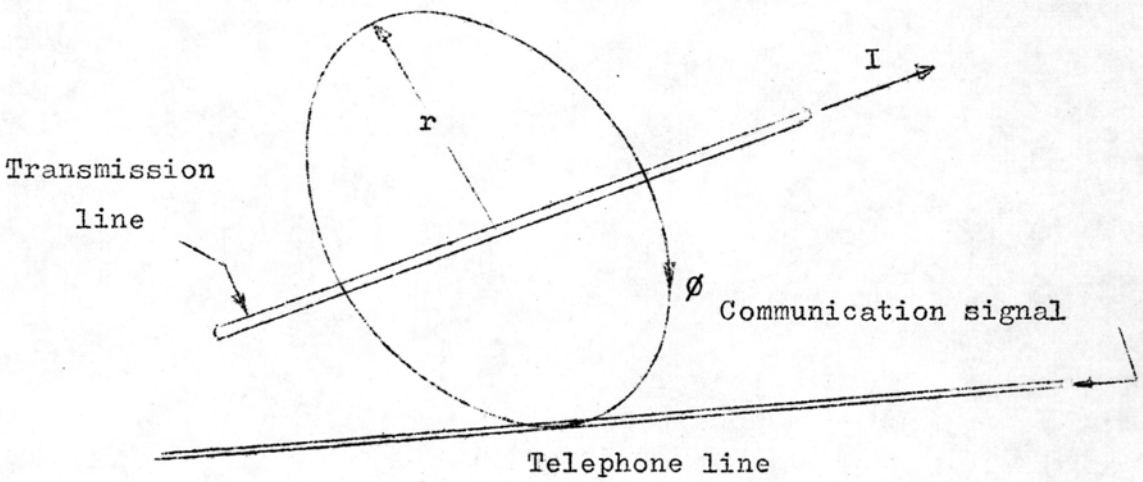

Fig 22.

The Interference of Telephone Line.

Fig. 22 shows the telephone wire which used as the transmission path of the pilot wire system is carrying the communication signal. The flux (ϕ) which is produced by the current in the transmission line, will induce the voltage in the telephone line as in the equation.

$$e = n\frac{d\phi}{dt}$$

Where e = voltage induced in the telephon line

n = number of turn of telephone line in this case n = 1

$\frac{d\phi}{dt}$ = rate of change of flux with respect to time.

This induced voltage (e) that causes interference in the telephone line.

c) in the case of 3-phase transmission system, the current in each line lags each other at 120° and so dpes the fluxs linkage as in Fig.21

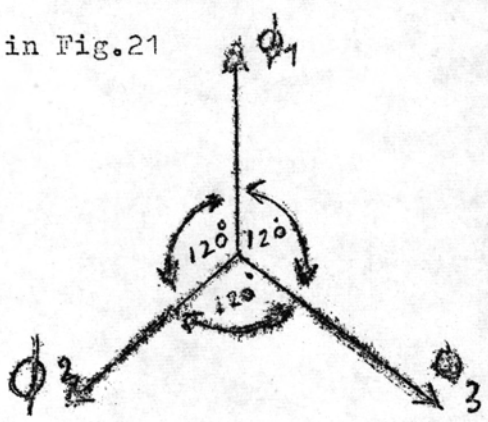

Fig.23 The Vector Diagram of Flux.

When the unbalance occurs, the magnitude of $\phi 1 \neq \phi 2 \neq \phi 3$. The vector sum of these flux will result the resultant flux ϕ which can produce the interference as in the case b. And if the transmission load is balanced, the vectors sum of $\phi 1$, $\phi 2$ and $\phi 3$ is zero, no communication interference occures.

2. The sparks and microsparks which occur at the obsolete conductors and insulators and insulators, as previously described, this afect can be eliminated by using bare conductor which this type of conductor is used in both transmission line and distribution line of MEA. system. So the interference of the telemetering and supervisory control system communication caused by sparks and microspark can be get rid of.

3. The corona of the high voltage transmission line, from experiment, the affect of corona can not be found in the VHF links of the present MEA communication system. The confirmation of this experiment can be explain theoritically as follow:

In high voltage transmission system, the smaller the conductor the more corona loss will occur, the value of corona loss will increase when the moisture increase. The corona - discharge from the high voltage transmission lines will produce

The random noise which causes the Radio Tnterference and Television Interference.

The measuring of the Radio Interference due to corona loss can be made by the Radio noise meter method, from Electric Transmission snd Distribution, it's result is obtained from experiment with the transmission line of 25 mm. in diameter, or cross section area about 500 Sq.mm by increasing the voltage step by step, it shows that, at voltage below 180 kv. the Radio Interference due to corona loss is minimum.

Consider the MEA. transmission line, the cross section area of the line is about 800 Sq.mm. which is bigger than the experiment sample (500 Sq.mm), so the value of Radio Interference Voltage must be less than the value from the experiment.

Another reason is that, the transmission voltage of MEA. system is rated at only 69 kv. which is in the range of A - B in the graph, the corona loss in this range is so little that it can be negligible. From above two reasons, the affect of corona loss in MEA transmission lines will not cause Radio Interference of the control and communication system.

Table 5

List Price

Type	Description.
VHF	80 watts 2 channels (a) ₱ 52,000
	30 watts 4 channels (a) ₱ 25,000
UHF	UHF Transceiver 10 watt (a) ₱ 112,920
	Carrier Multiplex (a) ₱ 124,840
Microwave	complete set (a) ₱ 1,200,000
PLC	1. PLC
	2. WT (a) ₱ 150,000
	3. CC
	4. LMU
Pilot Wire	-