

## **CRS in India – Infrastructure & Technology considerations**

The Community Radio Policy announced by Government of India in December 2002 and later liberalized in 2006 makes non-profit NGOs, autonomous bodies, and educational institutes etc. eligible to establish a Community Radio Station of their own. The organization should be a registered body and should not have any political affiliations. The policy allows setting up a CRS with a transmitter having maximum effective radiated power of 100 watt (250 watts in special cases). The maximum height of antenna permitted above the ground is 30 mts., and the station is expected to cover a range of 5-10 kms. Ground is now set for establishment of community radio stations by interested organizations; however, it is the fear of technology and lack of sufficient technical inputs, which may be a stumbling block. It is, therefore, necessary to have a preliminary knowledge of theory of broadcasting, concept of propagation and basic understanding of technicalities to have a comprehensive plan for establishment of a CRS.

### **Technology behind Radio:**

The frequencies in which we speak, sing and hear are called Audio frequencies. They are in the range of 20 to 20,000 Hz. The waves generated by our vocal chord, musical instruments etc., are acoustic waves and are converted into electromagnetic waves by the microphone. Audio frequencies from various sources like mike, CD player, turn table, etc., are mixed at the studio console and are fed to a transmitter. At transmitter, these audio signals (information) modulate a high frequency carrier wave and then this modulated wave is transmitted through an antenna. At the receiving end, the audio information is separated from the Carrier frequency and is directed to the speaker. Modulation allowed for CRS is FM, in which the carrier frequency (allocated station frequency) varies in accordance to the audio information. FM is considered better than AM due to better signal quality / better reception. The transmitter cost is also comparatively low and antenna systems are much simple and safer. The radio signals in FM / VHF band follow space propagation, i.e., near line of sight path giving rise to

uncovered pockets in shadow zones. Hence, location and height of transmitting antenna is very important factor while planning the FM service.

### **Criteria for Site selection:**

After deciding to set up a CRS, the most important decision is choosing the right location. There may be various factors, economic, social and technical. The best trade off is to be achieved while taking the resources and the specific goal of the CRS into consideration. Some of the important factors to be considered are:

- Establishment cost / Financial resources.
- Terrain profile.
- Availability and reliability of power supply.
- Manmade and ambient noise.
- Ventilation and freedom from dust.
- Likelihood of lightening and water damage.
- Availability of space to erect towers / masts.
- Accessibility to the participants.
- Acceptability by the community.
- Security considerations.

Housing the CRS in an existing building may be cost effective but has limitations in optimal planning of studios and ancillary areas. The accessibility of the location is vital, as a CRS primarily depends on volunteers, who may prefer a neighbourhood radio station. As the CRS is meant for the community, the acceptability criteria ensuring free and easy entry to community members without hindrance becomes primary. In case of FM broadcasting, the Effective height of the transmitting antenna is the major factor in determining the coverage area. If the station is located at a hillock, it will have a great bearing on the coverage. Availability of reliable power supply is another important aspect, particularly, in remote areas. Before deciding the location, it is important to

critically consider the role, target audience, type of content, hour of operation and future expansion plans of the CRS

### **Technology Considerations:**

The solutions for 100 watt CRS may vary from earth to heaven. One may get a very preliminary low cost station operational in around Rs. two to three lakhs. It is the numbers of desired studios, acoustic treatment, choice of acoustic material and choice of studio and transmitting equipment, which will decide the cost further.

### **Studios:**

The studios of a professional radio station are acoustically treated. This is done to ensure that there are no excessive sound reflections (cathedral effect). The walls are generally covered with perforated cardboard tiles or other acoustic material backed by 1.5' thick glass wool layer. Fig. 1 illustrates the design of a typical sound studio. A recording studio has normally two functional areas. One is the acoustically treated room where the artists, talkers or the performers sit. This room has professional microphones, output of which are transported to the second functional area via audio cables. The second functional area is separated from the main studio (acoustically treated room) by a double glass window to ensure sound isolation. This room is the hub of technical activities. The room houses the console, which receives signals (inputs) from various audio sources. The output of the console is transported to the recording device which may be cassette, reel or digital recorders or a computer. The acoustic treatment of the recording studios is important to ensure the right reverberation time (R/T), which is different for professional Music, Drama or Talk Studio. Desired R/T is achieved by the right combination of room design, its shape, acoustic treatment of walls, carpeting, false ceiling etc. This involves huge expenditure, which may not suit a CRS. Cheaper options such as use of cardboard egg trays, thick cotton curtains, coir mats and other cheap absorbing materials may be a good choice for community radios. Editing booths are required to prepare the finished audio product out of recordings. This

function can also be performed in the studios in off period. The playback studio or ROR(Read over Room) is used by the announcer/anchor to present the live broadcast. This studio houses Audio play back equipment such as CD players, Tape Decks, MD Players, Turn tables, CTRs, Computer, presenter mic(s) and phone-in- units/ telephone hybrid to conduct interactive programmes. CRS may have single three-in-one studio for all these functions or can have separate ones or combination of two depending upon requirement and investment potential.

### **Audio Equipment:**

The choice of equipment for the community radio station will depend upon the financial resources, type & quantum of programming and future expansion plans. Fig. 2 illustrates a typical broadcast chain. A wide range of options are available for each type of equipment and a basic understanding of various types of equipment will help in optimum planning of the set up.

Microphone is the beginning of the broadcast and is the most vital equipment. They are categorized by their construction, sensitivity and frequency response. A Dynamic microphone generally costs less and is more rugged, thus suitable for CRS application. Condenser microphones are more sensitive and generally have better frequency response. However, they are comparatively delicate and need a phantom power supply. Microphones are also categorized by their pick up patterns. An Omni-directional microphone can pick up sound from all directions equally, whereas, Uni-directional microphones pick up sound only from desired direction thus rejecting the unwanted sounds and is best suited for vocalists and music instruments. The omni directional microphones are generally used in audience reactions, in a talk show. The bi-directional microphones which pick up sounds from front and rear are also preferred microphones for In-studio discussions / interviews.

The console, commonly known as mixing desk is the heart of studio. It helps a presenter to choose one or more inputs from various sound sources, vary their level

(loudness) and mix them if desired. This mixed / final signal is transported to the transmitter/ recording destination. Normally, there are two outputs in a console having individual fader control. The task of broadcast console is not just mixing various input signals, but also processing the sound quality using equalizers and advanced options.

Wide options are available for recording & playback equipments. Whereas a professional broadcast studio depends mainly on Hard Disc based recording systems, CTRs (reel machines), professional CD players having balanced output & fader start facility, Turntables etc., CRS can work pretty well with commercial/ semi-professional CD players & cassettes recorders. The OB (outdoor broadcast) equipment are much more important for CRS. Preferred choice of many professional broadcasters for OB is still portable reel machines like NAGRA UPTR because of their unmatched quality. However, quarter inch tape being expensive and bulky, is being virtually extinct. A good quality compact cassette recorder is perfectly adequate for recording interviews, conferences and meetings. Quality is generally not good enough for recording live music or sound effects. Mini disc systems are generally too fragile for field recording. They may be suitable for recording interviews. But, due to rather poor audio compression systems used, they are not suitable for quality music recording. Professional digital flash memory recorders are the recording systems of the future. They are available in various models and have excellent features like no mechanical noise, fast transfer of recorded material to PC via USB port for editing, and ability to select different recording formats.

### **Transmitting Equipment:**

The transmitter is the core piece of the equipment in a community radio set-up. It has two basic segments – Exciter and RF Power Amplifier. An Exciter is nothing but a low power transmitter having output of few milli-watt to 4 watts. The exciter houses an Oscillator, which generates Carrier Frequency or Station Frequency and a Modulator. RF Amplifier enhances the power of the exciter to 100 watt or to any other desired level. Most of the FM transmitters available these days are stereo. The CRS may not have

stereo audio production equipments and / or the members of the community may not be having the stereo receivers. Under such circumstances, the stereo capability of the transmitter is rather disadvantageous as the coverage of stereo transmitter is much less than that of a mono transmitter and can be disabled. While procuring a transmitter some of the important factors to be kept in mind are output power, frequency range, RF output impedance, frequency stability, modulation type, modulation capability, signal-to-noise (S/N) ratio, input power, DC operation, ambient temperature range, harmonic distortion, inter-modulation distortion, audio frequency response etc.

Apart from protection from heat and dust, Power fluctuations, RF reflection and lightening are possible dangers for transmitters. RF reflections may cause immense damage and burn out of the RF power stages. Mismatch may be caused due to improper antenna, improper tuning of the antenna or loose connections between the transmitter and the antenna. Many transmitters have inbuilt protection and switch to reduced power in case the VSWR value crosses 1.6 and trip as soon as it crosses 2. In hilly areas a lightning arrester connected to a low resistance earth pit is essential for protecting the equipment. It is advisable to have separate earth pits for RF and Audio.

Just as a bad loud speaker in a good music system may defeat the very purpose of the composite system, an improper choice of the antenna may reflect adversely on the design of the transmitting system. The antennas are broadly characterized by their radiation patterns, polarization and gain. Gain of the antenna adds up to the ERP of the transmitting system. Higher gain antennas will be costly, heavy and difficult to install, and will need a more solid structure / tower for erection, which may not always be possible for a CRS. The preferred antennas for CRS can be a single bay dipole or two bay dipole or a 5/8 wave co-linear vertical antenna.

## **Broad Categorization**

There can't be a one stroke single solution for establishing a CRS. To save the establishment cost, one may be tempted to work on a very primitive and may be

unprofessional system, which may work for a few months or may not work at all. On the other hand one may invest huge amount in creating infrastructure, which may remain underutilized. Hence, while deciding on the technical system, it is important to have a clear perception of – what CRS wants to achieve and what are the expansion plans. One may categorize CRS in three broad categories –

- a) A Campus radio station should ideally have two studios, one for playback and one for recording. The studios may have regular acoustic treatment, various audio production and editing equipments and a professional console. Each studio should ideally house one to two computers for recording and editing the audio. The studios should be big enough to accommodate small batches of students as one of the important function of the studios will be hands on training other than recording / transmission.
- b) The mid-segment Radio Station that can be established by financially sound NGOs or KVKs etc. can compromise on the number of studios. This station can have one studio and may also compromise on the acoustics material. The studios may also contain limited audio production equipments and a semi professional console.
- c) The very preliminary set up may involve just a transmitter and basic audio recording and editing equipment. For this poor man's radio station, one may consider avoiding construction of an acoustically treated studio completely. Such a radio station can be placed in any room, preferably in an inner room for the sake of silence and freedom from dust and heat. The radio station can either rest on a table or may stand in a half rack. It may be designed to be fully independent from conventional power supply enabling it's placement at highest location, achieving significant greater coverage with much less financial implications and power requirements.

## Some Solutions

Many options are available in regards of equipment and technical solutions and it is not possible to lay the information of all the available systems, However as a preliminary information some systems are detailed below :-

- Radio in a box was developed by a joint project of UNESCO and ABU. The equipments are housed in a sturdy road-case. They include a 30/100-watt FM transmitter with adjustable transmission frequency, an audio mixer, CD cassette player, a customized patch panel and a notebook computer, which can be used for recording and play back. The system is ideal for disaster situations, training, capacity building and demonstration purposes.
- Suitcase Radio is a unique complete FM Radio Broadcasting Station contained in a single suitcase. It can operate on 13.8/28 volt DC power supply, thus, permitting battery operation from solar or other charging sources. The suitcase contains a 30 watt FM transmitter, a six channel compact audio mixer, two MP3 / CD players and two dual track mono recorders.
- BECIL, a Govt. of India enterprise, also provides professional solutions for setting up of CRS. The basic module consists of a common ON-Air and production studio, acoustically treated to provide optimum reverberation time. The recording and play back facility centers around a CD player and cassette recorder / mini disc recorder. The transmitting antenna used can be single element roof mounted antenna. The mid-range module can have an additional voice over booth, i.e. two numbers of studios and two-element antenna.
- AIR Resource Cell of Prasar Bharati also gives turnkey solutions for setting up of community radio stations. The set-up contains one or two acoustically treated professional grade studios with CD players,

Cassette players, mixing consoles, phone-in consoles, PC based recording system, head phones, distribution amplifier, on-air lamp and other necessities.

- NOMAD India Network too provides some low cost solutions. The very basic set up includes a 100 watt transmitter with antenna and RF cable, mixer, 2 CD / DVD players, 2 microphones with pre-amplifiers, 1 head phone and 2 field recorders. The second configuration includes computer with professional sound card, mixer, additional microphones, distribution amplifier and studio monitoring speakers.
- World Development Foundation, a charitable trust, working for the development of community media in India, also provides turnkey solutions. The foundation has set up few CRS for educational institutes and is also setting up stations for some KVKs.
- BEL, WEBEL Mediatronics, HCL, APG Broadcast Inf. Ltd etc also provide turnkey solutions for CRS in India. The solutions include creating an acoustically treated studio; hard disc based recording systems with CD and cassette players.

Community Radio Stations worldwide are working with zeal for empowering the not-so-privileged, local community by giving them a voice. The concept is indeed great, but one of the weakest points is the availability and maintenance of the equipment. The ready made solutions like Suitcase Radio and Radio in a Box are excellent options for putting up a radio station in remote rural locality in a hurry and with the least training and technical preparations. They can work on AC mains or on battery and do not cost an earth. Most community radio stations cannot afford to buy costly professional broadcast equipments. However, there is a caution - not much trained volunteers, unlike the professional studios, manage the CRS generally and number of users handling the equipment is also more. Heat and dust protection of such studios is also much less than the professional radio studios. Thus, it is natural to conclude that the life of average equipment in a community radio environment will be significantly less

than that of in a professional radio studio environment. Hence, while buying the equipment, it is important not to compromise on the ruggedness and longevity.

Ready-made solutions are easy to install but the best option is to breakup the Radio Station in pieces and procure the best affordable equipment, preferably indigenous. Though there cannot be a single common solution for the community radio setup but there definitely exists a need for giving a set of Indigenous complete solution, which will be suitable for the Indian environment. There exists a need for collaborative efforts to work on this project. It is equally important to educate the NGOs and eradicate the fear of technology from their minds to ensure that the dream of having 10,000 CRS in the country comes true.

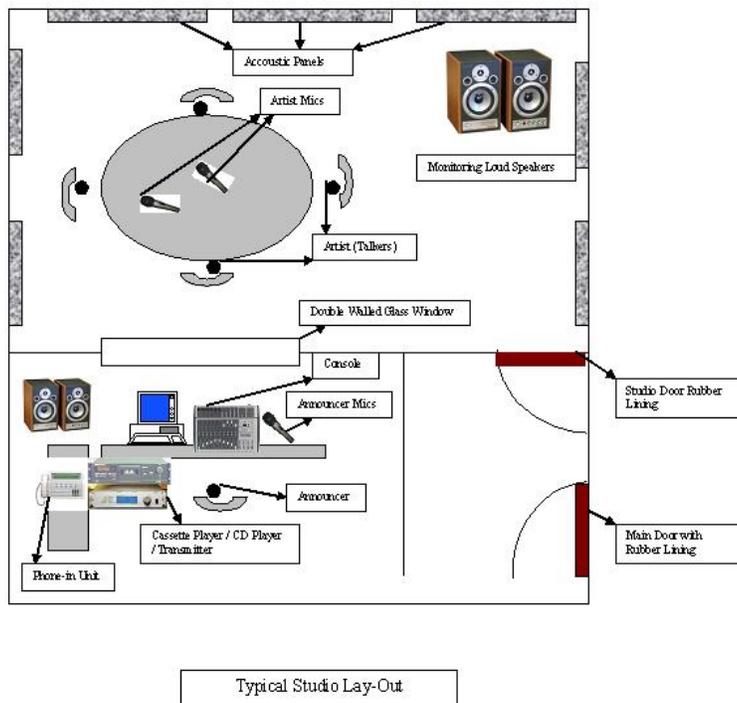
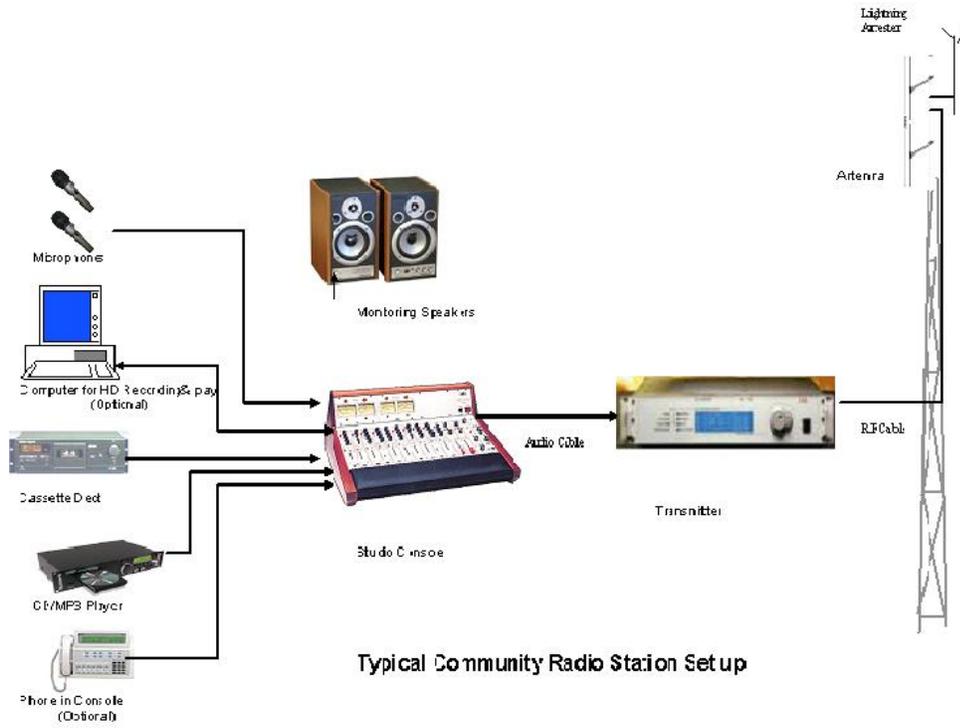


Figure - 1



**Figure - 2**