UTILIZATION OF TREATED URBAN WASTE WATERS FOR IRRIGATION PURPOSES IN THE SOUTH OF MALTA

by Mark Mangion[1]

1 - Background into Existing Situation

One of the biggest challenges facing any administration on the Maltese islands, has for many years been the adequate provision of water, be it first or second class water. This has mainly been due to the fact that the Maltese Islands are deprived of any permanent lakes or rivers. For many centuries the only sources of fresh water available locally were the underground reserves which can still be found today in the two types of aquifer lying beneath the Maltese rock.

The relatively recent setting up of the first reverse osmosis plant in 1980, to supply fresh water, has made it possible for the overall situation to be greatly improved. Today a total of 4 such plants supply approximately 51% of the total fresh water, equivalent to a daily production of 48,000m^3. Nevertheless the remaining 49% are still extracted from underground resources.

Due to the restrictions on natural resources, it had been felt necessary to ban the use of first class water for irrigation, and for this reason, way back in 1983, the Government of Malta commissioned a sewage treatment plant, at a capital cost of 16 million US$. At that time the aim behind the construction of this plant was to provide second class water, suitable for irrigation, for use in the southern parts of Malta. Reduction of the pollutant load into the Mediterranean sea was hardly considered, given that all sludges extracted from the process were, and are still today, dumped into the sea, together with the rest of the untreated waste waters.

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2 - The Sant' Antnin Sewage Treatment Plant

The Sant' Antnin Sewage Treatment Plant is a biological, activated sludge, purification plant employing preliminary, primary, secondary and tertiary treatment. The plant itself is served with raw sewage coming mainly from the inland parts of the island, occasionally supplemented by sewage from coastal areas, and up to one and a half years ago was completely manually operated, with a maximum throughput of 7,000m^3 of raw sewage per day.

Following a recent upgrade of the plant, the capacity of the plant was extended to a maximum input volume of 17,000m^3 of raw sewage per day. Improvements brought about by the upgrading include, the complete replacement of all electrical systems, partial replacement of mechanical units, and most importantly, the installation of a Supervisory Control And Data Aquisition, or SCADA system, which serves to control and monitor all of the plant's processes, including those in remote areas. This has helped to drastically reduce the required work force, while at the same time has proved being essential in the production of a better quality product.

Treated effluent from the plant is pumped to six different reservoirs, having a gross capacity of 19,000m^3. The reservoirs are located on high land, thereby enabling gravity distribution to the various users. Distribution of the treated effluent is effected via a complex network of open concrete channels and distribution boxes. This network has over the years proved, not only being difficult to operate and manage, but also opened to abuse and vandalism. Further, lack of continuous maintenance on the vast amount of channels can lead to large areas of land not being served by the effluent. Also, given that the existing system is open, control of the effluent destination is difficult, and more often than not water is taken on a first come first served basis, usually leaving users at the end of the network with little or no water at all. Collection of tariffs for use of the treated effluent, is today, still based on declarations made by the users, as to the amount of land being irrigated. One should point out that revenue collected from use of the treated effluent is marginal and in no way reflects the actual volumes of water utilized by the individual farmers.

The original idea behind the installation of such a distribution system was to keep in line with traditional means of irrigation water distribution, together with the much lower installation costs involved. Various attempts have to date been made to change the existing water distribution system into a closed pipe system, under pressure, but no concrete measures have as yet been effected.

It must be pointed out that in the existing circumstances, replacement of the channel system with closed pipe systems, even though involving a relatively high capital cost, would in the long run be of benefit to all. Coupled with modern technology it can ensure even and fair distribution of the water available, while at the same time making it possible for water usage to be individually metered, thus enabling water production costs to be recovered through the collection of suitable tariffs. Water wastage, currently at large, will also be greatly minimized.

As already stated, the existing sewage treatment plant's capacity has recently been upgraded to 17,000m^3 of raw sewage per day, of which up to 95% can be distributed as treated effluent or second class water. Nevertheless, water supply for irrigation has very much remained on a demand-supply basis. This has often created quite few problems to the plant's management. Demand for irrigation water, while being fairly constant throughout the dry season, tends to fluctuate excessively at change of season and throughout the wet season, which can sometimes extend from September to March. Given that any biological treatment plant requires sufficient time which can run into several days, in order to cater for a substantial increase or decrease in production, the plant's management has often had to bend backwards in order to accommodate demands by the farming community. It must be stated that these problems will be overcome if, and when the plant is equipped with an outfall discharge facility, which will enable the plant to operate continuously at full capacity with the irrigation water being dispensed as required.

The current peak production from the plant during the dry season, is in the region of 11,000m^3 of effluent per day, of which 75% are used for irrigation purposes, while the remaining 25% are used by factories located in a nearby industrial

zone. Unlike the agricultural sector, demand for water by industry is constant throughout the year.

Quality of water form the existing plant is currently kept according to WHO standards, for crops eaten raw, since no national legislation exists. However, studies are currently in hand in order to ensure that regulations within EU legislation, with respect to treated urban waste water standards, are in force. It is envisaged that national regulations will be ready by the year 2002. Typical water quality parameters currently being adhered to are, BOD_5 values of < 10 mg/l, Suspended Solids values of < 10 mg/l, Ammonia Nitrogen values of < 2 mg/l and Faecal Coliform counts of < 3 / 100 ml.

One negative characteristic of the treated effluent produced at the Sant' Antnin plant is its high salinity content. Conductivity values to the order of 4500□S/cm have occasionally been recorded in the treated effluent. This is partly due to the salinity content of the domestic drinking water supply, even if this has been greatly reduced over recent years. However, other factors, such as sea water infiltration into coastal sewer pipes and waste water pumping stations, also lend a helping hand. Studies carried out on various soil samples from the regions in question, have shown that the salt content tends to accumulate in the soils during the dry seasons, only to be washed clean during the wet seasons.

Nevertheless the overall execution and implementation of the Sewerage Master Plan for Malta and Gozo should contribute towards the reduction of these problems, through the elimination of sea water intrusion from the main sewer systems or, through the introduction of salinity reduction facilities in the new plants. Apart from the salinity problem, treated effluent from the Sant' Antnin Plant can be said to be within acceptable parameters, even because the presence of heavy metals and other toxins in the raw sewage is insignificant.

Current irrigation practices, by the farming community which benefits from treated effluent include, furrow irrigation practiced only in limited numbers, different methods of overhead irrigation, and drip irrigation. Further, crops being grown in the regions supplied by the treated effluent are various and include potatoes, beans,

tomatoes, cabbage, cauliflower, vegetable marrow, kohl rabi, melon and water melon, together with other varieties. A recent tendency to utilise the treated effluent in the cultivation of various types of forage is also being encouraged.

The total area of land currently served by treated effluent is of 346 hectares, while an additional 497 hectares have the potential of being served if the irrigation system is upgraded and extended. The current setup enables some 450 full and part time farmers, from a total of 1062 registered farmers in the area, to benefit from this second class water.

3 - Future Plans - Sewerage Master Plan

The capacity of the Sant' Antnin Sewage Treatment Plant, currently stands at 15-20% of the total volume of raw sewage generated on the islands. However, these values can be substantially lower during the wet season, depending on the local amount of rainfall. It is therefore evident, that a huge potential for waste water treatment and reuse, is currently being lost. Further, the full pollution load from raw sewage is to date being disposed of in the marine environment.

It is for these reasons, amongst others, that the Government of Malta through the Drainage Department, is at the moment in the phase of implementing the Sewerage Master Plan for Malta and Gozo, which apart from the rehabilitation of the main sewer lines and systems, shall provide for the construction of another three sewage treatment plants. It is estimated that the completion of all the envisaged works shall take place in the year 2005, at a total cost of Lm28 million. Further, the Sewerage Master Plan will cater for the setting up of suitable system networks, intended primarily to allow the treated waters from the new plants to be used for irrigation purposes, but also for other possible uses including industrial processes. Also included, is a waste management plan which will enable the treatment and reuse or disposal of sludges, which shall be produced from all plants.

It should be noted that the implementation of these works, extensive as they may seem, is already in hand, and some phases of the Master Plan including the upgrading of the existing treatment plant, have already been completed.