»LOMWATS« - an Attempt to Treat More Waste Waters in Developing Countries

LOMWATS stands for "Low Maintenance Waste Water Treatment Systems" and describes more a concept than a technology. And it describes more a need than a solution. Until now, LOMWATS describes first of all a project, financed by the Commission of the European Union and the State Office for Development Co-operation of the Free Hanseatic City of Bremen, carried out by BORDA in co-operation with SIITRAT and AFPRO from India, HRIEE and CEEIC from China and GERES from France. Within three years of project period, technologies and dissemination strategies are to be identified which suit the large number of smaller waste water polluters in Developing Countries who, up to now, discharge their waste waters untreated into the environment.

Any waste water treatment plant should require as little maintenance as possible. Still, LOMWATS is neither meant for large municipal sewage treatment plants nor for larger industries who have the scientific and management capacity to operate a well maintained on-site waste water treatment plant, utilising the latest treatment technology. LOMWATS is meant for cases where waste water flow is relatively small but dangerous because of the large number of similar cases, and where sophisticated treatment systems would not be constructed under the prevailing conditions or would, anyhow, never work. The project started with the question: Why are such waste waters not treated and what could be done to stop the pollution?

It is typically for this group of polluters that:

- there is no control of and mostly no knowledge about the waste water flow, neither in quantity nor in quality;
- there is little, if none, knowledge about even the simplest waste water treatment technology. As a consequence of that, there is no proper maintenance of the actual discharge system;
- there is often little space available for natural treatment systems (like simple oxidation or sedimentation ponds);
- waste water is brought to the privat boundary and then "forgotten";
- a legal framework for waste water management is either not functioning or not at all existing and as a consequence of it, there is no consciousness about the existing malpractice at the side of the polluter;
- there is no social pressure - which means that there is no social awareness about the problem or no power with the people who suffer from polluted water.
- cost for waste water treatment and safe discharge had never been included in any budget of the polluting enterprise, households or institution.

LOMWATS turns its interest towards measures which can be taken up immediately without waiting for so many pre-conditions to be fulfilled. As an example: If there is a lack of consciousness with the polluters, a traditional reaction of a project would be to trying to build up consciousness. LOMWATS instead says: OK, consciousness is lacking, what in spite could be done?

From the technical and economical point of view, a treatment system for this group of polluters must be

- robust, e.g. it should perform even when waste water flow is irregular,

- long lasting and trouble-free within certain limits, but should demand action if those limits are not kept,
- compact enough to be constructed on the plot of the owner,
- safe enough to be constructed near the source of pollution (either households, factories or institutions),
- cheap enough to be affordable,
- efficient enough to be worthwhile to construct to fulfil the legal requirements for discharge of waste water, or to recover the investment by saving penalty fees.

If such a technical system has been found, the problem of realisation is not yet solved. The following pre-conditions are to be fulfilled:

- somebody must calculate or determine from experience the dimensions of the treatment unit,
- somebody has to design the system accordingly to the local site conditions,
- somebody must produce complete work drawings and somebody at the side of the contractor must be able to read complex technical drawings, even if he or she does not understand the treatment system as such,
- and somebody must be able to physically construct the system (which probably is the easiest of those points).

Most wastes and waste waters contain valuable raw material and utilisation of by-products of the treatment process may reduce the operational costs considerably, or could help to protect the environment, both on the ground as well as in the atmosphere. To utilise those effects

- somebody has to know possible alternatives,
- somebody has to judge if those alternatives are relevant,
- somebody has to judge them economically,
- somebody has to plan and name the management requirements,
- somebody must be able to design the system in all technical details,
- and somebody has to link the knowledge with the investor of such treatment system.

Because, most of the treatment systems would be rather small, it is not possible to employ high qualified engineering teams for each and every plant. Standardisation of at least the major components is a pre-condition for successful dissemination of LOMWATS. Together with standardised construction, maintenance practice must also be standardised. The septic tank is an illustrating example how hardware is accepted but necessary maintenance is neglected - and the main reason for this is not negligence but lack of understanding! Because of its trouble free operation, a septic tank is considered to be maintenance free, which of course is not true if treatment performance shall reach the optimum level. Regular desludging is a must, but in 95% of all cases it is done too seldom or never.

Since there is no waste water treatment system without maintenance, the LOMWAT-system itself should somehow logically or naturally call for its maintenance by creating minor trouble if neglected. At the other hand, it should be easy to rectify the cause of such troubles, otherwise, to accept a possible mess would be easier than attending the plant.

LOMWATS are possible alternatives for domestic and less dangerous industrial waste waters. Since inflow quality and quantity are normally not checked, the discharge quality and quantity can not be guaranteed, either. LOMWATS are thought for housing colonies, hospitals or schools and smaller industries. In most of the cases only little land will be available for constructing a waste water treatment system. Therefore, complete treatment through aerobic and anaerobic processes can not be expected. Consequently, LOMWATS will be incomplete in purification and unreliable in performance. Yet, LOMWATS is the only *realistic* approach in many cases. There is a simple calculation and a problem oriented philosophy behind it: Hundred plants with 30% efficiency are more effective than 10 plants with 90% efficiency:

The LOMWATS-project has just started and, up to now, does not propagate anything; definitely not to fight environmental pollution less strictly. But the project starts from the assumption that *ideal* solutions are per definition not *real* solutions and the problem of water pollu-

tion demands immediate action. LOMWATS tries to find a realizable compromise between the ideal and the real. There are several tasks to be fulfulled by the project:

- elaborating technical principles with potentially high treatment properties and reliable day to day performance,
- elaborating guidelines for choosing a suitable technology for a given case,
- elaborating administrative instruments to replace rather stereotype discharge standards which proof to be counter-productive in certain situations, and
- elaborating the principles of dissemination strategies for LOMWATS.

As far as technique is concerned, all known treatment technologies are principally acceptable for LOMWATS but emphasis lies on anaerobic treatment systems, because they are more likely to be installed as there would be less space required than for aerobic systems. Further, the plant can be placed directly near the point of discharge because the system is almost totally closed. Aerobic treatment systems require either large open space and thus, demand a certain distance from places were people live or work, otherwise energy consuming installations of rather high-tech quality would be needed.

Fully mixed anaerobic digesters, similar to the well known agricultural biogas plants, would demand large digesters for large volumes of waste water and thus, are too costly. High rate reactors, like UASB (up-flow anaerobic sludge blanket) fermenters, AF (anaerobic filter) or hybrid systems of the two, have to be checked for their suitability as LOMWATS. Locally available filter material (e.g. bamboo) will be tested for its efficiency and reliability under uncontrolled daily conditions. Digesters using the UASB-effect will be constructed and monitored even in cases where formation of stable sludge blankets inside the digester can not be controlled or guaranteed. Digesters with and without biogas utilisation will be compared, not only on economic grounds but as well from the view point of mass dissemination.

One other major point of interest is the question of motivation: What makes a potential polluter asking for a LOMWATS if he has to pay for? What, besides legal pressure, could attract investment money? Which measures, subsidies, incentives, penalties, fees, etc. could lead to a rapid demand for LOMWATS? Who, at the level of government administration must be convinced to legally supporting the idea of LOMWATS? The answers to these questions will be different from country to country. The present project concentrates on India and China only, realising already substantial differences in proposed dissemination strategies. Further, it is to be investigated how far the utilisation of by-products (biogas for energy, slurry for fertiliser, treated water for irrigation) could recover part of the treatment cost, and what is equally important, could be integrated in the waste water producing organisations or enterprises without overloading the management.

Towards the end of the three years project period, many of above questions will be answered and strategies for dissemination will take shape. Without being premature, one may predict that the role of government regulations and the structure of fees for waste water discharge may play the major role in creating the demand for LOMWATS. The present practice will have to be changed, where strict discharge standards for new installations make any improvement, although sub-optimum, impossible if the administration is not able to provide or enforce the optimum solution. Otherwise, no treatment of waste water remains the tolerated solution, because necessary investment in optimum installations (and their required maintenance) would be too high at present, and in nearer future.

The concept of LOMWATS should not be discussed from a view point of ideology where one believes in either - or. LOMWATS are part of an overall attempt to improve the water quality in rivers, lakes and sea as quick as possible without waiting for an ideal and ultimate concept. It is well known that the sum of small and decentral treatment units might cost more than a few large centralised treatment plants. It is as well known that there is not enough free capital in the world to finance centralised systems in which waste water is transported and treated like in Western Europe. Besides, there is not even enough water available to operate sewer systems world wide.

LOMWATS wants to solve part of the problem where it can be solved now: With decentral treatment plants, financed with decentral money and planned and constructed with local means and manpower. If the ideal is not possible, let's just do the realizable.

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summary

LOMWATS – an attempt to purify more wastewater in the Third World

LOMWATS stands for low-maintenance wastewater treatment systems, a project BORDA is carrying out with Indian, Chinese and one French partners. The 3-year project, financed by the European Union and the Federal State of Bremen, is to develop technologies and dissemination strategies for LOMWATS.

The project began with the question "Why is wastewater from small and middle-sized sources so rarely treated, and what can be done to reduce contamination?" Without anticipating the results of the project, it is already evident today that fees for wastewater discharge play a key role in the dissemination of LOMWATS. The inflexible and often strict limits for pollutant content cannot be adhered to by small, unsupervised plants. If these limits are to be observed by new plants, a treatment system is dispensed with (even if it is a suboptimal plant) as long as the discharge of untreated wastewater is tolerated due to the lack of any acceptable alternatives. LOMWATS assumes it is more effective to build 100 plants with 30% purification than 10 plants with 90% performance.

sommaire

LOMWATS – une approche de solution pour épurer un plus grand volume d'eaux usées dans les pays du tiers-monde

«LOMWATS», qui désigne des systèmes de faible entretien d'épuration des eaux usées, est en même temps le nom d'un projet réalisé par BORDA en coopération avec des partenaires indiens et chinois, ainsi qu'un partenaire français. D'une durée de trois ans, ce projet est financé par l'Union européenne et l'État fédéré de Brême. Il a pour but le développement de technologies et de stratégies de diffusion des systèmes LOMWATS.

A l'origine du projet, il y avait la question de savoir «pourquoi les petits et moyens pollueurs procèdent-ils aussi rarement à l'épuration de leurs eaux usées, et que peut-on faire pour réduire la pollution ?». Sans vouloir préjuger des résultats du projet, on peut affirmer dès à présent que les taxes d'introduction des eaux usées ont un rôle essentiel à jouer en ce qui concerne la diffusion de LOMWATS. Les petites installations ne faisant l'objet d'aucun contrôle ne sont pas en mesure de se conformer aux valeurs limites, bien souvent rigoureuses, fixées en matière de charges polluantes. Cependant, lorsqu'il s'agit du respect absolu de ces valeurs limites pour les installations neuves, on renonce à construire une station d'épuration (laquelle serait pourtant optimale) aussi longtemps que l'introduction d'eaux usées non purifiées est acceptée en raison de l'absence de solutions de rechange acceptables. LOMWATS part du principe qu'il est plus efficace de construire 100 installations possédant une capacité d'épuration de 30 % que 10 installations d'une capacité de 90 %.

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Contents

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