

**International Journal of Innovative Research in Science,  
Engineering and Technology**

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 4, Issue 7, July 2015**

# **Effect of Unplanned Dumping of Sludge on Local Fauna in Pali Textile Area**

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**ABSTRACT:** In Pali textile area, the treatment processes concentrate some of the impurities in a sludge along with the microbial excess biomass. Water treatment also produces a sludge from the chemical coagulation and separation of impurities. The treatment and disposal of these sludges should be considered as an integral part of the treatment process. The treatment processes should be regarded therefore as a low-solids stream (effluent or drinking water) and a high-solids stream (sludge). Humans deposit about 70 g per capita per day of solids into wastewater. With 'garbage grinders', this can reach 100g per day. The impurities present in the wastewater must either be transformed into innocuous end-products or be effectively separated from the effluent stream. Impurities which are removed are drawn off as side-streams to the main flow and partially converted into gaseous products. Treatment and disposal of side-streams is an essential part of the overall treatment process, and frequently they contribute significantly to the total cost of treatment.

**KEYWORDS:** Pali, textile, sludge, treatment, wastewater, cost, effect, unplanned dumping, local fauna

## **I. INTRODUCTION**

The National Green Tribunal (NGT), ordered suspension of work in the textile dyeing and printing units in Pali district which were operating without the necessary approval from the Rajasthan Pollution Control Board (RPCB). They had not obtained the requisite "consent to operate" from RPCB, which is mandatory to operate any industry which is potentially polluting. The NGT order came in response to a case filed by farmers seeking relief from the pollution caused by the industrial units. But even a week after the NGT order, none of the units have been shut down, complained an aggrieved farmer, Mahaveer Singh Sukarlai. "More than 600 dyeing units are operating in this area, of which more than 90 per cent are operating without consent to operate or have expired consents. A group of officers came for site inspection after the court order, but we have not got any relief," said Sukarlai, convener of Sri Kisan Paryavaran Sangarsh Samiti,[1,2] which filed the petition before NGT. When contacted, R B Maurya, regional officer of RPCB in Pali, confirmed that none of the plants have been shut as yet. He said RPCB officers are scrutinising records of the industrial units to assess the number of consents to operate that have expired and reasons thereof. "Our senior officers have inspected the units after the court order. We are awaiting furthers orders from them for action," Maurya said. Another RPCB official said the Board is in the process of framing policies to mitigate pollution in the area. Rajesh Thapiar, senior environmental engineer of RPCB, said, "We are framing policies upon which we can take action and prevent pollution in the area. It will take another two to three days to frame a policy and then appropriate actions will be taken." [3,4]

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Pali district, which is 70 km east of Jodhpur and on the bank of river Bandi, has three industrial areas—Mandia road industrial area, industrial area phase II and Punayata industrial area. These have several industries, but it is the textile units that dominate. Together, these industrial areas employ about 30,000 people, more than 25 per cent of whom are employed in the textile units. Dyeing and printing, the wet processing components of the textile units, contribute the most to water pollution in the area. According to RPCB, the dyeing and printing units in the area have common effluent treatment plants (CETPs) of 34.86 million litres a day (mld) capacity, about half of which is being utilised currently by the dyeing units. The treated effluent, according to the board, is let out into the river. [5,6] The Nehra dam downstream of Pali Industrial area stores the water and supplies it for irrigation to more than four villages. Trouble began when the dyeing units started switching from cotton to synthetic fabrics to cater to changing market needs. Earlier the dyeing units in the area were processing cotton fabrics, hence the effluent generated was alkaline in nature and the effluent treatment plants were also built to treat the alkaline water. However, with changing trends the units started dyeing synthetic clothes, which generated acidic effluent and the treatment could not keep pace. The result was untreated/partially treated effluents being released into the river. Centre for Science and Environment (CSE), a research and advocacy organisation in Delhi, studied the area at the request of the farmers. The CSE report said that the common effluent treatment plants installed in the area for treating textile effluents are not capable of treating the effluents to prescribed levels, resulting in the discharge of untreated and partially treated wastewater into the Bandi river, [7,8] which does not have freshwater for about nine months a year. It also reported that contaminants were percolating into the groundwater. The study found that groundwater in the Bandi basin 50 km downstream was contaminated with lead, arsenic, chromium and nickel. Farmers moved court against the pollution in 2002. This prompted the state to pass a directive in 2004, recommending closure of companies operating in non-industrial areas to check pollution in the Bandi river. The companies appealed against the order but the court upheld the decision in 2008 and asked the companies to shift out of non-conforming areas. It also ordered the state bodies to use treated water from CETP for recycling or agriculture. The pollution board was ordered to set up a flow meter at every industrial unit to measure their actual

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discharge. In 2009, the Union Ministry of Environment and Forests declared the area as critically polluted and banned expansion of any industry in the area.[9,10]

But the pollution never came under control. Two years ago the farmers staged protests in front of the collector's office over illegal discharge of untreated effluents into the Bandi. "Forty to 50 villages are affected by the polluted water. We have tried everything but we have not found any solution. Our land is damaged, our groundwater is contaminated, our livelihood is in question and no one is willing to take any action," says Sukarlai. The sludge even after wastewater is treated is dumped in unplanned manner and its effect hampers the local fauna.

## II. DISCUSSION

Sludge is a semi-solid slurry that can be produced from a range of industrial processes, from water treatment, wastewater treatment or on-site sanitation systems. For example, it can be produced as a settled suspension obtained from conventional drinking water treatment, as sludge from wastewater treatment processes or as fecal sludge from pit latrines and septic tanks. The term is also sometimes used as a generic term for solids separated from suspension in a liquid; this soupy material usually contains significant quantities of interstitial water (between the solid particles). Sludge can consist of a variety of particles, such as animal manure. Industrial wastewater treatment plants produce solids that are also referred to as sludge.[11,12] This can be generated from biological or physical-chemical processes. Sludge treatment is focused on reducing sludge weight and volume to reduce transportation and disposal costs, and on reducing potential health risks of disposal options. Water removal is the primary means of weight and volume reduction, while pathogen destruction is frequently accomplished through heating during thermophilic digestion, composting, or incineration. The choice of a sludge treatment method depends on the volume of sludge generated, and comparison of treatment costs required for available disposal options. Air-drying and composting may be attractive to rural communities, while limited land availability may make aerobic digestion and mechanical dewatering preferable for cities, and economies of scale may encourage energy recovery alternatives. Dumping Management Program has stopped many harmful materials from being ocean dumped, worked to limit ocean dumping generally, and worked to prevent adverse impacts to human health, the marine environment, and other legitimate uses of the ocean (e.g., navigation, fishing) from pollution caused by ocean dumping of sludge. Sludge management is the end of the treatment train for solids. [13,14] The sludge or solids that have been removed from wastewater by either primary or secondary treatment must also be processed before it can be disposed or reused. The management of sludge or biosolids has been a constant challenge for communities. Since 1991, the United States federal government has outlawed the water dumping of sludge, causing the need to find ways to dispose of sludge.

Several options for sludge disposal currently being applied include: disposal in a landfill, composting, incineration, and land application. Landfill disposal includes dewatering sludge to remove water to reduce costs of transport and disposal and the use of the remaining substance to cover or add to a landfill. Composting sludge is similar to garden composting with grass clippings, but involves allowing sludge to lie in a static pile with wood chips or mulch. In sludge incineration, sludge is burned and the ashes are transported to a landfill for disposal. Land application involves transporting the sludge to a specific site, such as a farm or an agricultural entity, where it is spread onto the soil and used for its nutrient value, the same way the fertilizers are used. Reusing sludge that is clean and treated is a way of recycling nutrients back to land. Groups and various organizations around the country are developing safe standards for land application of processed sludge.[15,16] Sludge from wastewater flowing out of textile units in Rajasthan is now being treated at effluent treatment plants and then used as fuel in cement-making units. The treated wastewater is also being reused, ensuring 100% recycling of waste of the textile units. At least 2,625 textile units in Pali, Jodhpur, Balotra, Bithuja, Jasol, Sanganer, Bhilwara, Bagru and other places in the state have either been connected to common effluent treatment plants (CETPs) or set up their own effluent treatment plants (ETPs) to treat the wastewater that contains harmful chemicals. The operations at 225 textile units in Pali district of Rajasthan have come to a halt after a common effluent treatment plant (CETP) stopped accepting their effluents following a directive from the Rajasthan State Pollution Control Board (RSPCB). It was found that facilities at the CETP-4, one of the six such plants along Bandi river, were inadequate to handle the sludge from the units in the

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Punayata Industrial Area connected to it. With this, one plant is now shut, another is not operational and one is under construction

Sludge in colossal quantity is produced due to textile dye printing units in pali discarding wastewater. Among the options for sludge disposal, its application in the soil for better crop yield is the best option. There are pros and cons in using of sludge for agriculture use. Mention may be made that sludge comprises organic pollutants, heavy metals, and pathogens besides others. sludge poses a risk to human health because it associates with many pathogens that are harmful to humans such as *Salmonella* species, *Giardia lamblia*, *Rotavirus*, *Ascaris lumbricoides* etc. The workers working in the treatment plant are vulnerable to many infectious diseases due to direct exposure to untreated wastewater.[17,18] The farmers who apply sludges in their fields and the people who work in the treatment plant are frequently exposed to infectious diseases owing to their contact with sludge directly for a more extended period. Application of sludge suppresses many pathogens like *Verticillium*, *Sclerotium*, *Fusarium*, *Pythium* etc. The use of sludge in the soil has an antagonistic impact on the pathogen, and thus it acts as an agent to control pathogens. A conclusion may be drawn that sludge can provide nutrients to plants and suppresses many pathogens without causing any risk to human health if it gets proper treatment before its use.[19]

### III. RESULTS

There is a variable literature on the content of sludge which might inform on potential health effects in textile areas of Pali. Untreated sludge is capable of harbouring sometimes high levels of a wide range of bacteria (including drug-resistant forms), viruses and parasites and while differing forms of treatment reduces levels of each of these, the effect is of varying degree depending on factors such as initial concentrations and resistance of the organism to treatment. Chief amongst these organisms, with respect to risk to humans, are *Salmonella* spp, *E. coli*, *Campylobacter*, *Giardia* and *Ascaris*. Hepatitis viruses can be found in as do a range of other viruses if looked for, and it is likely that intensive searching for specific organism may often result in positive finds even if at low levels which may not be important in terms of risk to health. sludge is a significant source of cadmium and lead and to a lesser extent mercury and arsenic. Many chemicals, including a wide range of pharmaceutical agents, can be found in at variable concentrations. Treatment of can result in dilution or concentration of these substances depending on their chemical interactions and properties. It is difficult to identify a “best treatment” which would reduce chemical content across the board. While radioactivity can be detected in sludge (from a range of sources including medical treatment and from industrial sources) levels are likely to be low although no repeated data on content in sludge could be identified in the time available for this project. Treatment processes reduce the level of pathogenic micro-organisms[20,21] (including drug-resistant strains) and PAHs in sludge only partially, and the pathogenic organisms that survive treatment are often of human origin. However, natural attenuation in soil of organisms from applied sludge can occur although to a variable extent where different factors (e.g. site) will affect persistence. Animals feeding nearby are also prone to diseases and death.

The three main exposure pathways are by inhalation, ingestion and trans-dermally. Of these, in the context of sludge to populations exposed non-occupationally, potentially the most important is the ingested route either directly, from water run-off or from food grown on treated soil. workers experience a wide range of exposure to airborne endotoxin, a pro-inflammatory molecule produced from bacterial degradation. Flu-like illness and lower respiratory tract symptoms are associated with endotoxin exposure, sometimes with high odds ratios, one study showing a dose response relationship between exposure and symptoms. Studies on infections and infestations in association with exposure to show that workers exposed to raw are at most risk. The risk of infection is largely dependent on the prevalence of infections in the populations served by the treatment plants and on the treatment processes employed. Hepatitis A and giardiasis are the best recognised infections, but the association between hepatitis B markers and exposure suggests that waste water workers should be vaccinated against both hepatitis A and B. Odour is the main complaint of populations non-occupationally exposed to sludge. Ambient odours may produce health effects by direct irritation and/or toxicological routes, through responses which genetically coded or learned aversions or may be due to co-pollutant exposure(s) that is part of the odorant mixture. It is also generally accepted that unpleasant odours act as



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warning signs or as indicators of potential risk to health but not as direct triggers to ill health. The nose is a very sensitive organ being able to detect very low concentrations of some aromatic compounds. The fact that a smell can be detected does not necessarily mean that the cause of that smell is adverse in terms of inducing an organic response in an individual. But where there is a perception that the source of the smell is potentially toxic, the fact that a smell is detected is often taken by the public as proof that the cause of the odour is truly toxic. Separating out these perceived effects from genuine effects can be impossible. [22]

## IV. CONCLUSIONS

Unnecessary dumping of sludge is unhealthy and hence it should be disposed properly. Preliminary treatment of raw involves screening to remove large objects such as sticks, bottles, paper, and rags, and a grit removal stage during which inorganic solids (sand, grit, cinders) rapidly settle out of the water. The screenings and grit removed in this stage of treatment typically are landfilled and do not become part of the sludge. Primary treatment involves gravity sedimentation and flotation processes that remove approximately half of the solid material that enters this stage. Solid material (both organic and inorganic) that settles out during this stage of treatment is drawn from the bottom and constitutes the primary sludge. In most POTWs, the floating material (oil, grease, wood, and vegetable matter) that is skimmed from the water surface during primary treatment is disposed of separately and does not become part of the primary sludge. Secondary treatment is a carefully controlled and accelerated biological process in which naturally occurring microorganisms are used to degrade (break down or digest) suspended and dissolved organic material in the wastewater. This material is converted into carbon dioxide that is released to the atmosphere and into microbial cell mass. In secondary sedimentation basins, the microbial cell mass settles to the bottom and is removed. This mainly organic material is called secondary sludge. Some treatment plants also include tertiary treatment steps designed to further reduce plant nutrients (nitrogen and phosphorus), suspended solids, or biological oxygen demand in the wastewater. Chemically precipitated phosphorus and filtration produce a tertiary sludge. Finally, the water undergoes disinfection treatment to destroy pathogenic microorganisms. The rejuvenated water is then released to a stream or river or may be sprayed over large areas of land. From a management and materials handling perspective, landfilling is perhaps the simplest solution. From an economic standpoint, landfilling presently compares favorably with other options. This undoubtedly will change, however, as landfill space becomes more limited and tipping fees (waste-dumping costs) increase. From an environmental standpoint, landfilling prevents the release of any sludge-borne pollutants or pathogens by concentrating the sludge into a single location. If the landfill is properly constructed and maintained, environmental risks are minimal. There are, however, risks associated with landfill disposal of sludge. Organic wastes undergo anaerobic decomposition in landfills, producing methane gas that could be released to the atmosphere. Methane is a greenhouse gas that has been implicated in global warming. Other gasses released from landfills can cause unpleasant odors. The large quantities of nutrients that sludge adds to a landfill pose a risk to the local environment. Should a failure of the landfill liner or leachate collection system occur, these nutrients could contaminate local groundwater and surface water. Landfilling sludge also takes up valuable landfill space and forfeits the potential benefits of the organic matter and plant nutrients in the sludge. [21,22]

Sludge incineration reduces the volume of the material to be disposed of, completely destroys pathogens, decomposes most organic chemicals, and recovers the small amount of heat value contained in sludge. The residual ash is a stable, relatively inert, inorganic material that has just 10 to 20% of the original sludge's volume. Most trace metals in the sludge become concentrated in the ash (a five- to tenfold increase in concentration). This material most commonly is landfilled, although it potentially could be used in construction materials. Incineration also releases carbon dioxide (another greenhouse gas) and possibly other volatile pollutants (cadmium, mercury, lead, dioxins) into the atmosphere. Incinerator operation requires sophisticated systems to remove fine particulate matter (fly ash) and volatile pollutants from stack gasses. This makes incineration one of the more expensive options for sludge disposal. As with landfilling, the potential benefits from organic matter and plant nutrients in sludge are lost. [23]

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