

Should Treated Effluent Discharge Standards for Paper Mills be Made Stricter?

Abstract:

More than 100 years ago, with growth in industrialization, there was a need to quantify pollution and treated effluent discharge norms. As that time, most of the effluent was discharged to river streams only, the effect of effluent on aquatic life was of major concern, and BOD came into practice, and got widely accepted.

The situations (mainly the norms) remain same for decades, but with rapid industrialization, development of new processes, technologies, chemicals, products and applications, a reduction in the norms was considered as the easiest route to reduce pollution. As a result, norms are being revised every now and then to make these stricter and stricter.

The aim of this article is to highlight the future problems which may appear due to making the norms too strict.

Introduction:

In India, the E.P. Act, 1986 specified effluent parameters like BOD as 30, and COD as 350 for most of the sectors. TSS, of course varied between 50 and 100 on case to case basis. For a long time, these parameters remained constant, but after a period of around 25 years, revision of norms was initiated and industry specific norms were published by MoEF (now MoEF&CC).

Furthermore, the standards notified for different other sectors are as under-

Date	No.	Sector	pH (SW)	pH (IR)	BOD (SW)	BOD (IR)	TSS (SW)	TSS (IR)	COD
09.07.2009	395	Pharmaceutical	6.0-8.5		30	100	100		250
30.03.2012	148	Electroplating	6.0-9.0		--	--	100		--
01.01.2016	4	CETP	6.0-9.0	6.0-9.0	30	100	100	100	250
15.01.2016	31	Sugar	5.5-8.5		30	100	30	100	--
13.06.2011	310	Pesticides	6.5-8.5		100		100		
07.05.2014	252	Dye and Intermediate	6.0-8.5	5.5-9.0	30	100	100	200	250
01.06.2011	288	Caustic Soda	6.5-9.0	6.5-9.0	--	--	100	200	--
18.03.2011	142	Rubber	6.0-8.5	6.0-8.5	30	100	100	200	250
04.11.2009	630	Hotel	5.5-9.0	5.5-9.0	30	100	50	100	--
01.01.2010	103	Cashew Seed Processing	6.5-8.5	6.5-8.5	30	100	100	200	--
06.08.2008	432	Coffee Industry	6.5-8.5	6.5-8.5	100				
10.09.2021	657	Tannery	6.0-9.0	6.0-9.0	30	100	100	200	--

Table-1: Mandated effluent discharge standards for various sectors.

All these norms are available at- <http://www.moef.gov.in> website

SW: Water discharged to surface water; **IR:** Water discharged for irrigation purpose.

Later, discussions started to reduce norms for paper industry also in the year 2018-19. Through mostly verbal, slowly and slowly, the message started spreading throughout the paper industry that our Government is consider to introduce sector specific effluent discharge norms for paper mills also, but with comparatively more strict parameters.

The Paper Industry Perspective:

As per the E.P. Act-1986, the concentration of various pollutants were as under-

Sl.	Mill	BOD	COD	TSS
1	Waste Paper Based (Small)	30	-	100
2	Large Agro Based Pulp & Paper Mills	30	350	50

Table-2: Norms as per E.P.Act-1986

At that time, the paper industry was a 'water guzzler' and the specific water consumption generally used to be to the tune of 150 KL/T for agro based mills, and 50 KL/T for waste paper based mills. To significantly reduce the pollution load by the paper industry, CPCB initiated a 'Charter' ('Charter for Water Recycling & Pollution Prevention in Pulp & Paper industries in Ganga River Basin') in the year 2012. This charter was aimed to reduce fresh water consumption, the effluent generation and the reduction in treated effluent parameters by means of incorporating BMT (Bare Minimum Technology); adequacy assessment, evaluation and up-gradation of effluent treatment plants and regular monitoring of the action plan by third party- CPPRI. To further reduce the pollution load, another Charter was released in 2015 which aimed towards achieving effluent parameters much below the norms (BOD-20; COD-150; and TSS-30) to ensure a 100% compliance of the mandated norms. The charter has a great vision. In case you are maintaining your system as per the charter, and there is some fluctuation in any process condition leading to an increase in effluent discharge norms, you'd still be achieving the mandated norms.

Well, the paper industry took it positively and started working to achieve the charter norms. As a result, both the fresh water consumption and effluent generation reduced significantly. At present, most of the wood/agro based units are operating at less than 40 kL/T water consumption, while the waste paper based mills are at less than 10 kL/T. The treated effluent generation from waste paper based mills (which contribute to more than 80% of paper production) is generally below 4-6 kL/T; and there are many mills which are now operating with ZLD (Zero Liquid Discharge).

However, we must not forget that the effluent discharge norms are not production based, and are concentration based; so with reduction in fresh water consumption and hence the quantity of effluent generation, the effluent would be containing much higher concentration of different parameters, like BOD, COD and TSS. This way, the mills need to treat more concentrated influent, and all the existing technologies are having their own limits.

In case we want to highlight the main point which indicate why BOD-COD norms should not be reduced further, these are-

1. Increased dependency on recycling compared to agro or wood based paper making.
2. Recent developments in process-applications from paper to waste paper.
3. Reducing the effluent discharge to river streams or water bodies to zero.
4. BOD itself is over-emphasized
5. BOD test needs to be revised according to mandated norms.
6. Paper quality issues

Let us discuss each of these in detail.

More Recycling:

Compared to just a couple of decades back, most of the paper in India is now being made by recycling. On an estimate, presently, more than 83% paper is being produced by recycling. But, the question is, "Are we recycling just paper?" The answer is "No". With paper, it is ink that has been used to print on paper; these are the chemicals which have been coated on paper to make paper smoother, glossier; it is the glue that was used to paste different sheets of paper to make a book in bound form, or to seal an envelope; there are chemicals which impart barrier properties to paper to make it more water and oil resistant in order to replace the plastics.

So, essentially, paper mills are not just recycling waste paper. They get paper already contaminated with ink and glue and so many other chemicals; and need only the papermaking fibers. Rest other elements are useless; and though a major part of these go with the recycled paper, yet a significant part of these go to the effluent stream. Of course, the effluent treatment is becoming more and more challenging for waste paper based mills.

Not only this, when you recycle a paper, your effluent gets concentrated, but when you recycle a previously recycled paper, the effluent gets more concentrated, and influent BOD-COD increase significantly.

It must also be kept in mind that compared to above, the effluent from wood based paper mills or agro based paper mills receive generally the uniform, stable and lower concentrations of BOD and COD in their influent, which is now comparably easy to handle.

Recent Developments in Paper Applications

The waste paper, paper mills get for recycling is not just the paper a paper mill had produced in the past. It has already passed through various other operations/treatments to make it suitable for customer needs. These treatments include- corrugating (addition of sodium silicate or other synthetic binder), coating (addition of starch, clays etc.) poly laminating (addition of some glue to make the poly layer stick to paper) and printing (addition of various printing inks). A conventional newspaper contains nearly 3% ink by weight of the paper.

For past couple of decades, plastic was the most growing industry, and most of the norms (specifically the food packaging related) were skewed towards the plastic. Let me give you an example. If I develop a cheap packaging material that replicates the properties of tomato peel or orange peel in terms of barrier properties; would that be acceptable as food packaging? No. Whether we need or not, the over-strict requirement of barrier properties has virtually made it impossible to pack bread, biscuits etc. in paper packaging, as it used to be done four or five decades back.

But, now, we want to avoid plastics. And the only solution remains is to coat the paper with barrier chemicals, and these chemicals must also have heat seal properties. To cater the market demand, every month, a new chemical is being introduced in market. For most chemicals, the only market requirement is to have a food grade certificate. The biodegradability of these chemicals is still not being assured by most of the chemical suppliers.

Imaging how the paper treated with such chemicals shall be recycled? Recycling mills would obviously put this waste paper too in high consistency pulper, make pulp, do screening and cleaning operations, refine the pulp and from that make paper again. During the papermaking process some of the chemicals would get separated and go to effluent stream.

If we consider both of the above points- more recycling and these chemical additions together, the effluent must be differently contaminated for different types of waste paper. To evaluate the impact of paper recycling as well as of different treatments, a few years back an experiment was conducted by me. Under this, waste paper was slushed with 10 times of distilled water by weight. The pulp so received was squeezed to collect the single pass back water. This backwater was filtered again to get filtrate without any suspended solids. The BOD of this filtrate was tested, and the results are being shared in Table-3.

BOD Test Results

Sl.	Waste Paper Quality Description	BOD
1	Newspaper, Hindustan Times, 27.09.2016, Delhi Metro	80
2	Newspaper, Economic Times, 23.09.2016, New Delhi	161
3	Newspaper, Times of India, 23.09.2016, New Delhi	361
4	██████████ Practical Sets UP-TET: Class VI-VIII (Good quality paper used for this book) Cover Only (Poly Laminated) Remaining Book	500 208
5	██████████ 10 Sample Question Papers, CBSE Exam. 2016, English (Recycled paper used in this book) Cover Only (Poly Laminated) Remaining Book	705 320
6	Fresh Corrugation (Dell Desktop Computer Box)	580
7	Multi recycled Corrugation	965
8	Egg Trey (Crate, Local)	1480

Table-3: BOD from single pass backwater from different grades of waste paper.

Names in the above table have been masked to avoid the name of publisher. Even if we look at the data for newsprint only, we get a variation in the range of 80-360 for different newspapers. Please do keep in mind that all three newspaper publishers are highly reputed ones in India, and one would agree that they are using the most eco-friendly inks to print the newspaper. Similarly, for corrugation, fresh versus multi recycled showed a variation from say 600-1000.

Here, we need to keep it in mind that this was just a single loop laboratory experiment while during actual process, when the back water is used again and again for pulping and other process operations, the difference between minimum and maximum values would increase further.

Zero Discharge to Recipient River Streams or Water Bodies:

A major emphasis was given in the charter was towards zero discharge to recipient river streams or water bodies by increased recycling and reusing effluent for irrigation purpose. As already indicated, the BOD norms for land discharge of effluent is 100. In such a case where mills effluent is not going to any river stream, reducing BOD further even below 30 would not benefit aquatic life or the environment. In fact, to achieve reduced BOD load, any mill would have to do more aeration, consume more electricity, thereby increasing emission load as most of electricity generated in India (around 67%) is based on thermal power plants.

Isn't BOD Over Emphasized?

If I visit your home or office, what welcome drink would you offer me except water that has a low BOD? Tea, coffee, milk, juice, lemonade, shikanji, cold drinks etc. all of these have very high level of BOD. BOD itself is not a parameter that harms human beings- the ingredients that result in increased BOD might be. After all, no human being is going to drink a lot of treated mill effluent. True that a high BOD harms the aquatic life, but when you ensure treated mill effluent is not going to any river stream, how the aquatic life is going to suffer?

During the past couple of decades, the effluent generation by the mills has been significantly decreased, so in case the mills treated effluent would hardly result in any increase in BOD of the river stream. This can also be seen by the fact that in most of the polluted river streams, E.Coli has been a major concern, which cannot be claimed to be from any mill effluent.

Does BOD Test Need a Revision?

The accuracy of any test method is evaluated on the basis of repeatability and reproducibility. According to IS:3025-44 (1993) (reaffirmed 2009), a Glucose-Glutamic acid (150mg/L each) solution should show a BOD in 200 ± 37 mg/l. Not only this, it is also mentioned in BOD test method that BOD being a bioassay test, it can be easily get influenced by toxicants, poor seeding etc. As even a standard synthetic (G-GA) sample, freshly prepared can result in a variation of ± 37 BOD at 200 bod level, it is logical to find out possible variations at 20 or 30 BOD levels, before any further revision in discharge norms is proposed.

Paper Quality Issues

As indicated earlier, the more you recycle, there is more possibility that contaminants from the waste paper shall also be going with the produced paper. Too much water closure has led to various quality related problems; the most common being the foul odor in kraft paper. Probably this is the topmost issue for India's leading paper research organization—CPPRI, which has organized several workshops to discuss possible ways to reduce the foul odor. UNDP is also actively working on the issue and pilot plants have been installed in several paper mills to find out a sustainable solution for the same.

Can Mills Easily Maintain Revised (Proposed) Norms?

This could be another important point to discuss. Many mills can say that they are already achieving norms much below the existing norms. But does that mean the norms should be made stricter? I think, a better option could be to collect the recent sampling data from the regulatory agencies- mainly CPCB, SPCBs and third parties collected samples as per instructions of CPCB and SPCBs. The data should be viewed in the way to find out how many samples collected during past 3-4 years qualify for the revised (proposed) norms. From this data, the maximum value of lower 80% reading values may be considered for revised standard. In case, the value, so achieved is even more than say 30 for BOD; a review must also be made to understand why even the existing norm is not being easily achieved now.

Well, if most of the mills are achieving say less than 20 BOD, should they be punished by making the norms stricter? If out of your 10 subordinates, someone finishes the same job in time, would you assign more work to him? Do more work to him, but with the same salary and punishment for possible future delays seems logical? In table-1 above, the BOD norm for effluents from so many sectors is notified as 30. Why, for paper mills, it should be reduced any further?

Small Versus Large Paper Mills

Since long, the classification of paper mills has been made on the basis of production capacity; and norms were prepared on this basis. However, during past couple of decades, the situations have been drastically changed. Unlike the past, the waste paper based mills are also operating with large production rates. Paper recycling technology has improved a lot and most of the mills are using good production practices. On the other hand, unlike the past, the raw material (waste paper) quality -in terms of its recycling impact on effluent characteristics- has also decreased substantially. The quantity of effluent discharge has been reduced for wood and agro based paper mills, but for waste paper based mills, the quantity has drastically reduced, thus making it more difficult to handle.

Considering the present circumstances, it is justified to come out with the previous classification of "small versus large" and paper mills should be classified as "Wood based, agro based or waste paper based" paper mills.

Conclusion:

From the discussions above, it can be seen that reduction of BOD-COD norms for paper mills effluent is not suitable to implement at present. The whole world is now focusing on getting rid of plastics, and hence, the immediate need is to review various packaging related standards to make packaging materials more eco-friendly. The Charter was originally implemented only for mills for Ganga Basin paper mills; it must be implemented on pan India basis. There is also a strong need to study the back water and effluent characteristics from different grades and sources of waste paper; and the outcome of this study must be considered while revising the standards. It must also be accepted that it is not the right time to implement the stricter standards.

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