Ohio EPA Policy DSW-0400.004 **Removed**	**Design Criteria; Rotating Biological Contactors**	
	Statutory reference: Rule reference:	Ohio EPA, Division of Surface Water Revision 0, August 1, 1988 Removed, April 30, 2003
THIS POLICY DOES NOT HAVE THE FORCE OF LAW Pursuant to Section 3745.30 of the Revised Code, this policy was reviewed and removed.		

This policy does not meet the definition of policy contained in Section 3745.30 of the Ohio Revised Code. Ohio EPA is removing this document from the Division of Surface Water Policy Manual and is considering addressing this topic in a future rulemaking.

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Design Criteria, Rotating Biological Contactors

PURPOSE: To help ensure future RCBs designed for use in Ohio do not develop problems encountered by many of the present RBC systems currently in use in Ohio.

BACKGROUND: Rotating Biological Contactors (RCBs) usually consist of plastic vertical disks mounted on a horizontal shaft that rotates, turning the media in and out of the wastewater. The shafts are usually arranged in the stages. Micro-organisms on the media oxidize the organic wastewater constituents and can remove ammonia-nitrogen.

RCBs provide a higher level of treatment than conventional high-rate trickling filters and are generally less susceptible to upset due to changes in hydraulic or organic loading than conventional activated sludge. The process control involved in the technology is less complicated than the activated sludge process.

RCBs have been plagued by major construction and operation problems. Problems included break down of media, shafts, and bearings. Operation problems included low dissolved oxygen concentrations, nuisance bacterial growths, and solids accumulations in undesirable locations. Because of these problems, RBC equipment manufacturers modified their equipment and design criteria to include more durable shafts, bearings, drive systems, and more conservative design criteria. Ohio EPA is still concerned about the problem of shaft related failure and the ability of the RBC units to provide satisfactory performance for the expected design life of the treatment plant.

POLICY: Consideration must be given to the following when planning and designing RBC treatment units.

The major objective of the RBC process is the removal of soluble organic matter by conversion to insoluble microbial cells. A summary of the recommendations which should be addressed during the planning and design of RBC processes are as follows:

1. RBC units shall be preceded by primary treatment consisting of grit removal and primary settling of fine screen facilities. If fine screens are used, additional media shall be provided based on the additional loading.

2. The surface settling rates of the final clarifiers following an RBC process shall be based upon peak hourly flow rates. Hydraulic loadings should not exceed a peak hourly flow rate of 800 gpd/sq/ ft. if the 30 day effluent suspended solids objective is 30 mg/l. Rates as low as 500 gpd/sq/ ft. may be required for treatment beyond secondary if tertiary filters are not provided.

3. Require RBC manufacturers to provide a twenty year replacement guarantee on the shafts and a two year replacement guarantee on the media.

4. Studies of existing facilities show that RBC units are better off being covered with fiberglass huts rather than placed in a building. RBC units in a building will create severe corrosion problems due to the high humidity and H_2S release. However, it is much easier for operators to observe and work on the units when placed in a building. If a building is recommended, then the electrical components must be located in a separate area or comply with underwriters requirements for such an atmosphere, and an internal hoisting device for removal of the shaft media must be provided. If fiberglass huts are recommended, suitable means for removing them should be specified. Both housing options must provide maintenance access to individual shaft drive mechanisms, motors, and gear-reducers.

5. The organic loading of the RBC system must be accurately defined. Consideration must be given to any recycle flows due to the high concentrations of BOD and TKN associated with such flows.

6. The design of a RBC unit for secondary treatment must not exceed a loading of 2.5 lbs. soluble BOD/day/1000 sq. ft. and 5 lbs. total BOD/day 1000 sq. ft. on any stage based on average flow. Corrections for temperatures below 55 degrees fahrenheit must be considered. In the absence of specific data, the preliminary design should be based on a maximum loading of 1.25 gpd/sq/ ft. based on average daily flow.

7. The design should be based on peak flows when the ratio of peak hourly flow to average daily flow exceeds 2.5. When the ratio of peak hourly flow to average daily flow to any RBC assembly is less than 2.5, it would be appropriate to design the plant on process kinetics based on the estimated average stage-by-stage BOD reduction.

8. High density media (a 12 foot diameter RBC assembly containing more than 100,000 sq. ft. of surface area in a 25 foot media unit) must not be used on the first two stages of any treatment train. The loading on the first high density media stage shall not exceed 3.5 lbs. total BOD/day/1000 sq. ft.

9. Load cells must be provided for the first stage of standard and high density shafts as a minimum.

10. Provide weirs or other devices to regulate and measure flow at the influent to each RBC train. In addition, flow regulation must be provided for the influent of each stage.

11. The process must include the ability to step feed, bypass, and isolate individual RBC stages. If the first stage is being overloaded, this provision will allow a portion of the flow to be diverted to alternative low density RBC stages.

12. Wastewater flow perpendicular to the shaft, should be encouraged to develop uniform loading over the entire shaft. Single shaft trains must be low density media with piping to

allow feed to either end and load cells on both ends. This should allow reversing flow when one end exceeds the recommended weight.

13. A positive mechanism to strip excessive biofilm growth from the media such as variable speed drives, supplemental air, air or water stripping, or the ability to reverse shaft rotation must be provided.

14. Air drive systems must be capable of providing a positive method to regulate the air supply. Flow controls and appropriate air system balancing controls must be provided along each air header for both air drive and supplemental air systems.

15. Field studies show that air drive systems require more power per shaft than mechanical drive systems. The average power requirement for mechanical drive systems is about 4 hp/standard shaft, whereas air drive requires about 7 hp/shaft (350 cfm/shaft). These power requirements are much higher than the manufacturer's suggested power usage. Therefore, during a cost-effective analysis, power costs should be based on actual field experience.

16. RBC processes proposing nitrification will require special studies to document overall system performance.

This policy is to be applied when reviewing design of proposed RBCs and treatment processed for publicly owned treatment works. Portions of this policy could apply to RBCs treating industrial wastewaters.