Research on New High-Efficiency Centrifugal Dehydrator

Year of Research	2006・2007	

(Purpose)

About 800 centrifugal dehydrators have been used in sewage treatment plants across the country to date. In recent years, during which global warming has become a problem, there has been an increasing demand for power saving in addition to low moisture content. Thus, a low mechanical power type high-efficiency centrifugal dehydrator (referred to in the research as the "new high-efficiency centrifugal dehydrator") was developed to meet the needs of the times.

In this research, the low mechanical power type high-efficiency centrifugal dehydrator is compared to the high-efficiency type to verify the advantages of the former in terms of energy and space saving. Once its features, aptitude area, and performance have been clarified, the aim is to compile technical matters about planning, design, maintenance, and the like.

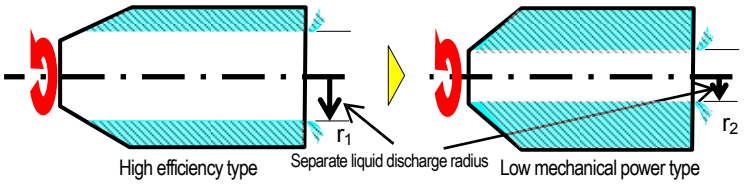

Figure 1 High efficiency type and low mechanical power type

(Results)

(1) Features of dehydrator

The separate liquid discharge radius has been made smaller than that of the high efficiency type to reduce the fluid acceleration power. By doing so, a low mechanical power requirement and low electrical power consumption have been achieved (Figure 1). For space saving, the footprint was reduced by changing the motor placement and by other means.

(2) Results

The low mechanical power type was compared with the high efficiency type to verify the advantages of the former in terms of the following.

The low mechanical power type includes three models (Types A, B and C), which differ in terms of the structure for electric power saving. Thus, the examination was performed on each model. The target was to achieve ① equal or superior dehydrating performance (moisture content, chemical feed rate, and SS recovery rate), ② a reduction in power consumption of 20% or more, and ③ a reduction in equipment's external footprint of 10% or more.

Table 1 shows a comparison of mechanical power output and electric power consumption, and Table 2 shows the results of a footprint comparison.

The low mechanical power type can be applied to small to large treatment plants, and all the models are equal or superior in dehydrating performance to the conventional high efficiency type. It is possible to reduce power consumption by 20% or more. A reduction of 10% or more was successfully achieved for the equipment's external footprint.

(3) Effects of introduction

Compared to the high efficiency sludge dehydrator, the developed equipment was equal or superior in dehydrating performance. A reduction in dehydrator power consumption of 20% or more and a footprint reduction of 10% or more were successfully achieved.

(4) Creation of technical manual

The research results were compiled into the “Technical Manual for Low Mechanical Power Type High Efficiency Centrifugal Dehydrator”.

Table 1 Comparison of mechanical power and power consumption (standard centrifugal force: 2,000 to 2,500 G)

m^3/h	Model	High efficiency centrifugal dehydrator		**Low mechanical power type centrifugal dehydrator**		Reduction in power consumption
		Motor capacity kW (Note 1)	Power consumption(at3%) kWh/m^3 (Note2)	Motor capacity kW (Note 1)	Power consumption(at3%) kWh/m^3 (Note2)	
5	A	22.5	1.7	14.7	1.3	-24%
	B	20.5	2.0	16.5	1.3	-35%
	C 1	37.4	2.6	20.5	1.9	-27%
7	A	41.0	2.6	24.0	1.6	-38%
	B	29.5	2.2	20.5	1.3	-41%
	C 1	48.9	2.4	24.0	1.9	-21%
10	A	52.0	2.4	37.5	1.7	-29%
	B	48.4	2.3	29.5	1.5	-35%
	C 1	63.9	2.0	37.5	1.6	-20%
15	A	77.4	2.6	48.4	1.6	-38%
	B	64.3	2.0	52.4	1.5	-25%
	C 1	74.3	2.4	48.0	1.4	-42%
20	A	105.4	2.7	70.4	1.7	-37%
	B	97.8	2.2	74.3	1.7	-23%
	C 1	127.8	2.2	70.0	1.7	-23%
30	A	147.8	2.6	94.3	1.7	-35%
	B	140.8	2.2	105.8	1.6	-27%
	C 1	155.8	2.4	93.5	1.8	-25%
50	A	215.8	2.5	154.8	2.0	-20%
	B	230.8	2.7	177.8	1.8	-33%
	C 2	241.5	2.3	182.2	1.8	-21%

Note 1: Motor capacity: Total value of main motor, differential speed motor, and lubrication unit (if installed).

Note 2: Power consumption when the treated sludge concentration is taken to be 3%, for both high efficiency type and low mechanical power type

Table 2 Results of footprint comparison

m^3/h		Equipment's external footprint					
		Model A		Model B		Model C	
		m2	Reduction rate	m^2	Reduction rate	m^2	Reduction rate
5	**L**	3.2	**-21.3%**	4.7	**-16.7%**	3.1	**-58.7%**
	H	4.0		5.6		7.4	
7	**L**	4.8	**-26.2%**	5.8	**-21.0%**	3.4	**-58.0%**
	H	6.4		7.3		8.1	
10	**L**	5.5	**-34.5%**	7.7	**-20.1%**	3.7	**-59.0%**
	H	8.4		9.6		9.1	
15	**L**	7.0	**-48.0%**	9.6	**-33.1%**	4.2	**-69.8%**
	H	13.5		14.4		14.0	
20	**L**	12.7	**-25.4%**	14.3	**-19.7%**	6.2	**-60.6%**
	H	17.0		17.8		15.8	
30	**L**	15.4	**-26.9%**	17.4	**-10.8%**	8.5	**-52.9%**
	H	21.0		19.5		18.0	
50	**L**	20.9	**-10.5%**	21.3	**-20.0%**	24.4	**-10.3%**
	H	23.4		26.6		27.2	

L: Low mechanical power type centrifugal dehydrator

H: High efficiency centrifugal dehydrator

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