

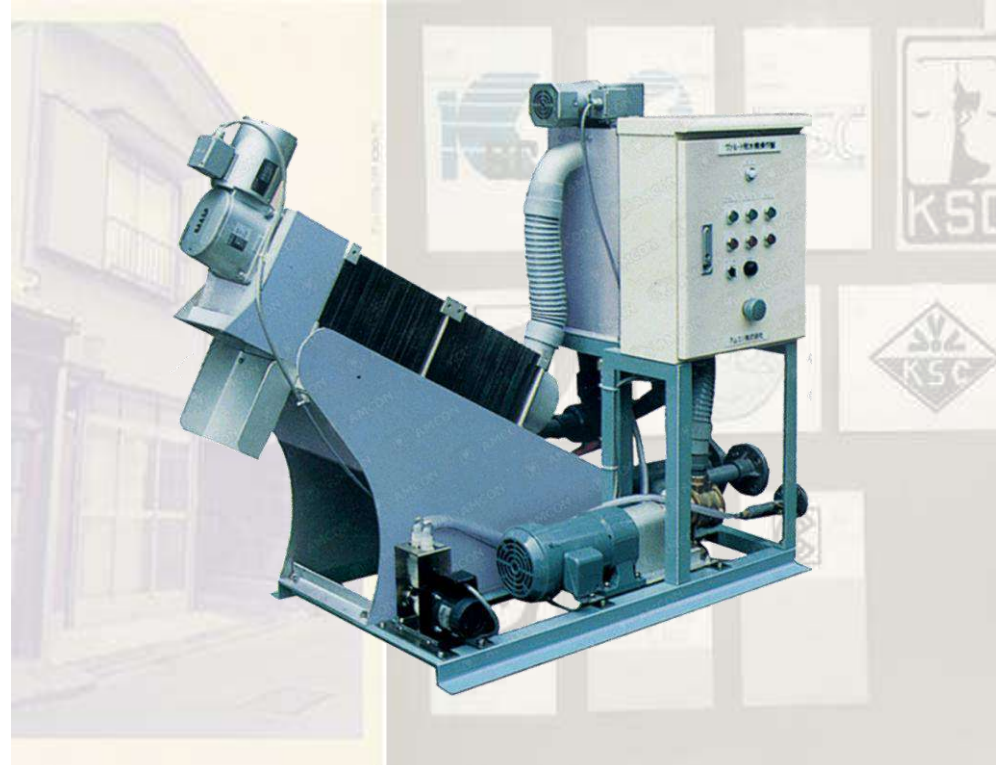


AMCON Europe s.r.o.

Sludge dewatering solutions

Company background

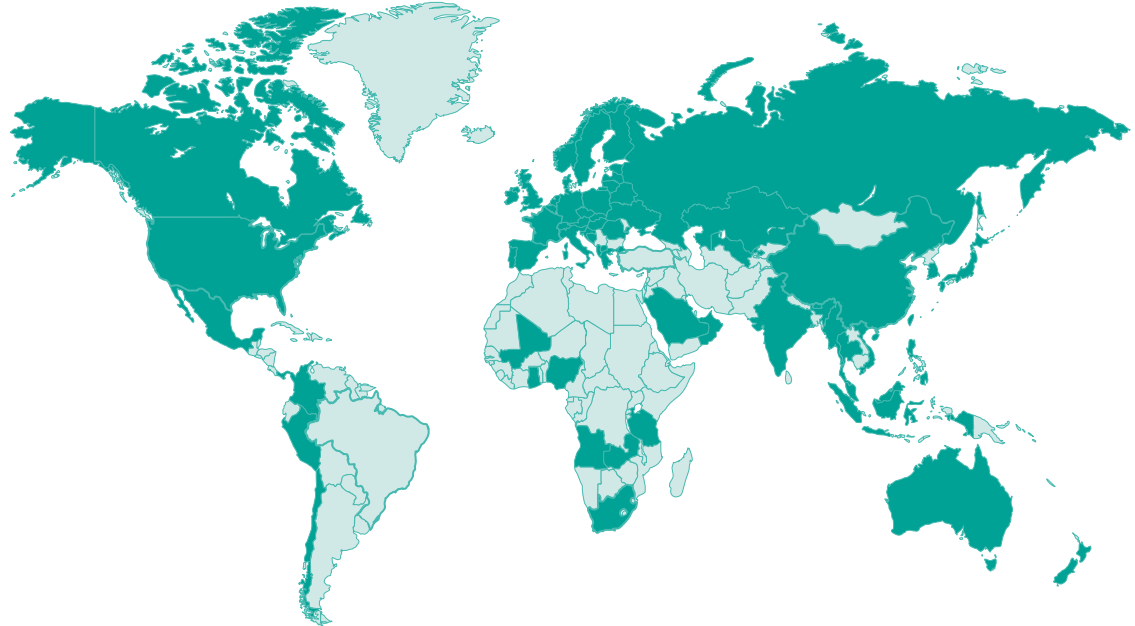
- **AMCON was founded in 1974 in Tokyo – Japan.** It remains a family business to this day, with offices around the globe.
- In that time, **rural areas** in Japan surrounded by mountains needed **decentralized wastewater treatment**
- Local, decentralized sludge dewatering required **small, operator friendly and affordable dewatering equipment**, which did not exist at that time.
- In 1992, AMCON introduced its first screw press dedicated for small plants of < 10 000 PE. A critical element was its revolutionary **moving-ring technology** that allowed stand-alone operation.



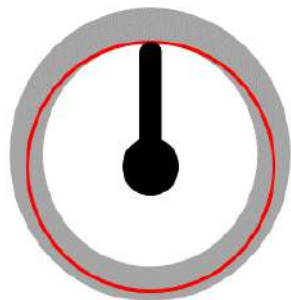
Company background



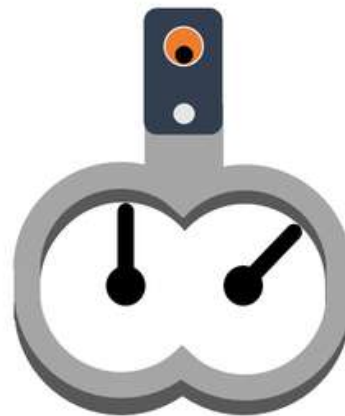
- **AMCON** has grown to a global company with **over 6000 Volutes installed** in 78 countries.
- The product line-up expanded, now with capacities **from 100 up to 200.000PE** on a single unit. We deal with **municipal as well as industrial** sludges.
- In 2021, we introduced the next revolution in sludge dewatering; **the Volute DUO** with its superior OPEX and broadened application range.



 **VOLUTE™**



 **VOLUTEDUO™**

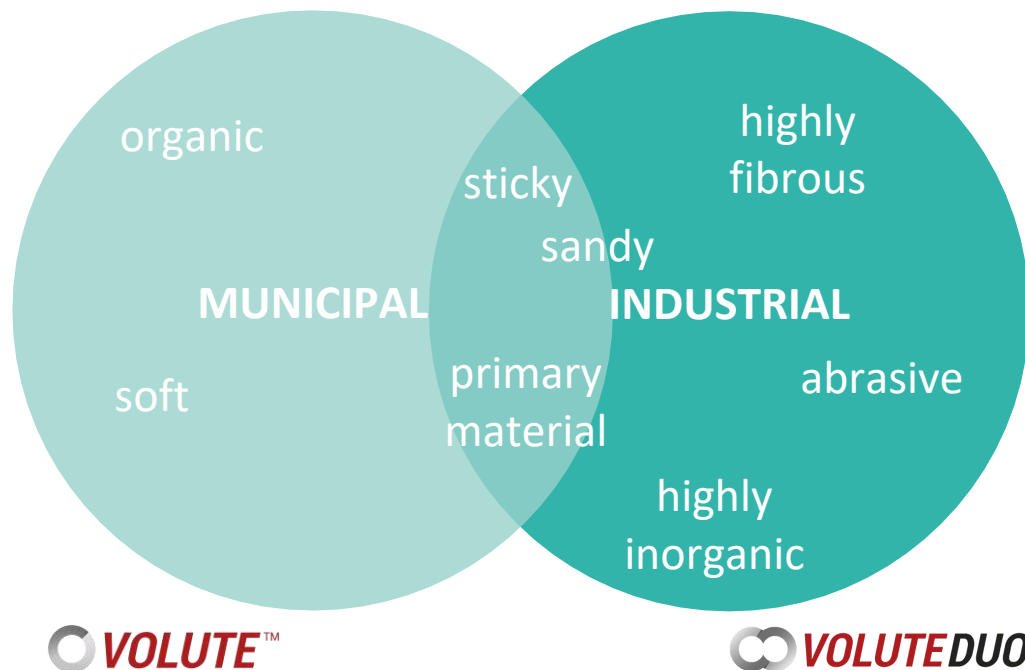



א.ב. טכנולוגיות
מיוחדת תעשייתית בע"מ

Amenity Convenience

AMCON®

Scope of applications VOLUTE and VOLUTE DUO



Classic dewatering screw presses are limited by how abrasive, fibrous and inorganic a sludge is.

Our unique RVP-series eliminates these limits, as it has 2 screws in 1 cylinder and separately driven moving rings.

- Huge increase in application range
- The only screw press available for certain sludges = strong USP
- Elimination of main wearables = even better OPEX.

Screw Presses – Main Types

Differences: HUBER and VOLUTE style cylinders



Source: www.huber-technology.com



Source: AMCON Europe

Description	HUBER-type	VOLUTE
Filtration element	Mesh	Fixed and Moving rings
Cleaning mechanism	Inside = brush mounted on screw flight Outside = pressurized water 'trolley'	Self-cleaning
Need of pressurized air	Yes	No
Need of pressurized rinsing water	Yes	No
Maintenance	Every few 1000h	Default of 10.000h

Differences: VOLUTE and copy-makers



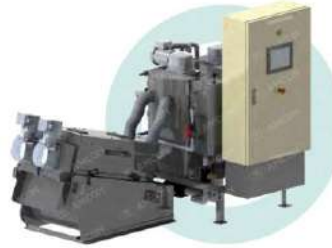
Almost all copycats' design is based on older VOLUTE ES Model



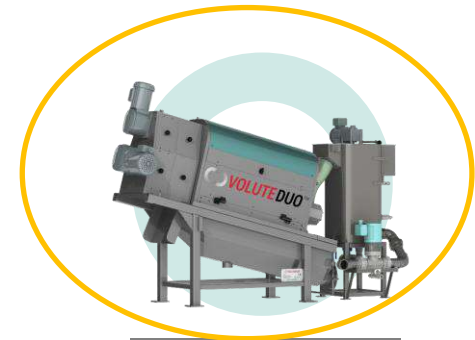
VT Series



FS Series



GS Series



RVP Series

Convenient Sludge Dewatering.



AMCON's Innovative VOLUTE DUO™ Screw Press for Convenient Sludge Dewatering

Clog-free self-cleaning mechanism

The heart of the machine is a cylinder that acts as a filter element. It consists of alternating layers of fixed and moving rings with a gap in between. Two screws running through the cylinder transfer and compact the sludge through the cylinder, squeezing out the water. An external driveshaft ensures the constant movement of the rings, creating an elegant and sophisticated self-cleaning function. At the same time, the precise guidance of the moving rings prevents their contact with the surface of the screws. This frictionless design greatly extends the lifetime of consumables. All while maintaining the typical screw press benefits such as ultra low energy and rinsing water consumption compared to alternatives.

Applicable to a wide range of sludge types

The two screws rotate into each other, breaking up the solids while transferring and compacting them towards the outlet. This makes the machine close to impossible to block, even with highly fibrous or inorganic sludges.

Frictionless design significantly reduces the costs of consumables

Thanks to its frictionless design, this model significantly extends the lifespan of its consumables, reducing the costs of sludge dewatering by over 50%.

External Drive Shaft

Moving Rings

Screws

Consumables cost
(Comparison with our FS model)

Calculated for 15 years of operation

AMCON's Innovative VOLUTE DUO™ Screw Press for Convenient Sludge Dewatering

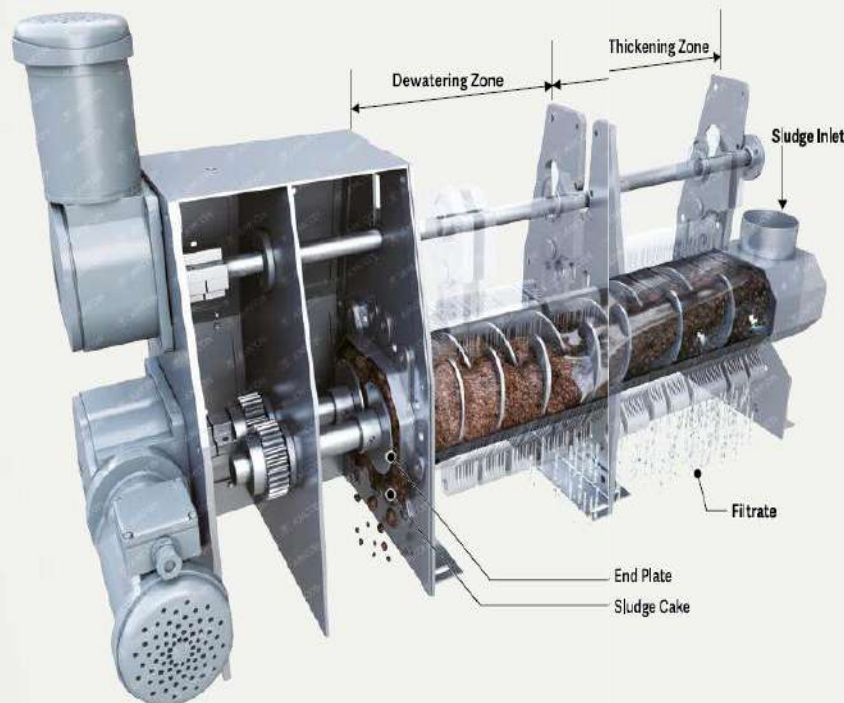
Clog-free self-cleaning mechanism

The heart of the machine is a cylinder that acts as a filter element. It consists of alternating layers of fixed and moving rings with a gap in between. Two screws running through the cylinder transfer and compact the sludge through the cylinder, squeezing out the water.

An external drive shaft ensures the constant movement of the rings, creating an elegant and sophisticated self-cleaning function. At the same time, the precise guidance of the moving rings prevents their contact with the surface of the screws.

This frictionless design greatly extends the lifetime of consumables.

All while maintaining the typical screw press benefits such as ultra low energy and rinsing water consumption compared to alternatives.

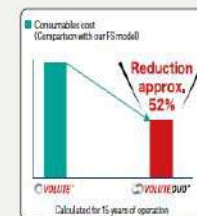
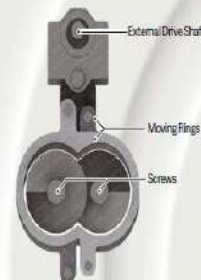


Applicable to a wide range of sludge types

The two screws rotate into each other, breaking up the solids while transferring and compacting them towards the outlet. This makes the machine close to impossible to block, even with highly fibrous or inorganic sludges.

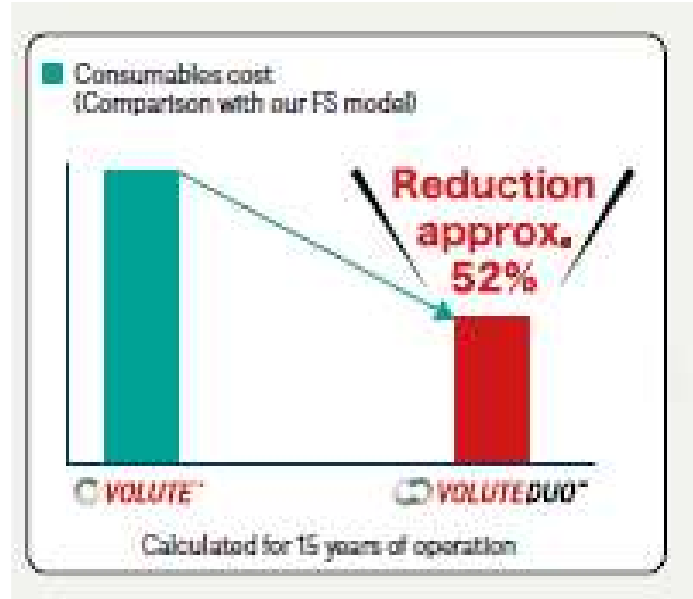
Frictionless design significantly reduces the costs of consumables

Thanks to its frictionless design, this model significantly extends the lifespan of its consumables, reducing the costs of sludge dewatering by over 50%.



השוואה בין VOLUTE ל VOLUTE DUO בהשוואה לעלויות תפעול

הפחתה של כ
52%



Differences: VOLUTE and copy-makers



- **30 years of continuous improvement** and development since obtaining the original patent in February 1992.
- **Unique products** for both municipal as well as industrial applications
 - GS series for very thin sludge
 - RVP series for inorganic, fibrous and/or abrasive sludges
 - ATEX for anaerobic digestion, refineries, etc.
- **Highly customizable solutions;** matching screw, rings, motors, material, feeding mechanism, etc. to your sludge
- Extensive fleet of **test- and rental units**, combined with a skilled service team, lab services and more.
- 2 years standard warranty with an option to extend **up to a total of 5 years warranty**.
- Comprehensive selection of auxiliaries (sludge feed pumps, cake pumps, poly prep. systems, sensors, flow meters, TS meters etc.)



VOLUTE vs Centrifuge

Based on end user pilot test results

General benefits of VOLUTE compared to Centrifuges

1. Up to 90% energy use reduction.

Centrifuge = energy for rotating water (99%) and solids (1%)

VOLUTE = only energy for lifting solids (1%) out of the water and squeeze them.

2. No noise

VOLUTE “noise” is at the level of a normal conversation, versus Operators who work with centrifuges must use protective equipment against excessive noise.

3. More favorable OPEX and robustness

VOLUTE’s lower rpm (3 rpm vs 3000rpm of a centrifuge) leads to plannable maintenance, more beneficial OPEX, lower chance on catastrophic failures.

4. Unsupervised operation reduces labor and extends working hours (reduces machine size)

The industry considers centrifuges to need an operator for supervision, while VOLUTE is made to run 24/7 with no structural supervision.

VOLUTE™ vs Centrifuge



Daveyhulme (UK) reference

United Utilities UK and Evergreen Water Solutions – our UK municipal sector distributor – conducted a 12-month pilot test at the world's oldest sewage treatment plan, Daveyhulme. The VOLUTE Dewatering Press model FS-402 was tested and compared to centrifuges.

Mr. Pat Horne, Bioresources Head of Strategy and Commercial Services, was overseeing the trial has said that the results with VOLUTE Dewatering Technology have been excellent:

*“Compared to conventional & traditional dewatering processes (centrifuges), we have seen a reduction in the power consumption by 82% of sludge dewatering from 23kWh per ton-DS to less than 4kWh per ton-DS depending on throughput settings. **For a site the scale of Daveyhulme this equates to potential cost savings in the hundreds of thousands of pounds per year.**”*

Source:

<https://www.unitedutilities.com/corporate/newsroom/latest-news/carbon-cutting-bioresources-tech-puts-engineers-in-a-spin/>



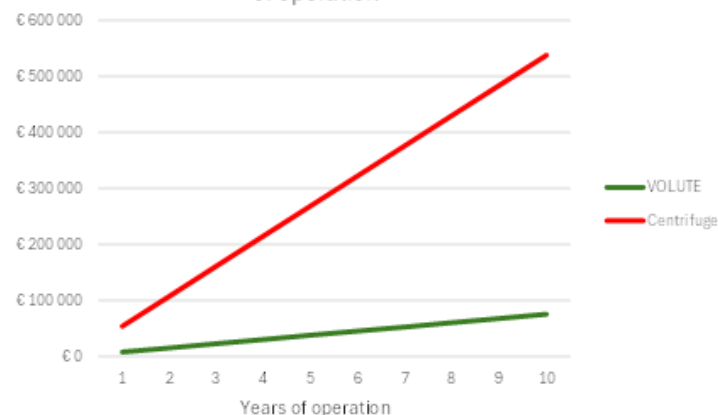
Comparison of energy consumption and calculated CO₂ emissions between VOLUTE and an equivalent centrifuge

VOLUTE™ Specification	VOLUTE FS-403
	30 m ³ /h 6,7 kW installed power
Centrifuge Specification	Alfalaval
	30 m ³ /h, Drum diameter: 500 mm Main motor 37 kW, Secondary 11 kW

	VOLUTE™	Centrifuge
Installed Power (kW)	6,70	48
Operating hours during the day	16	16
Operating days of the year	350	350

Cost (Price) of the 1 kWh (EUR)	0,20
2023 average EU CO ₂ emission intensity for electricity generation in the EU (g CO ₂ /kWh)	237

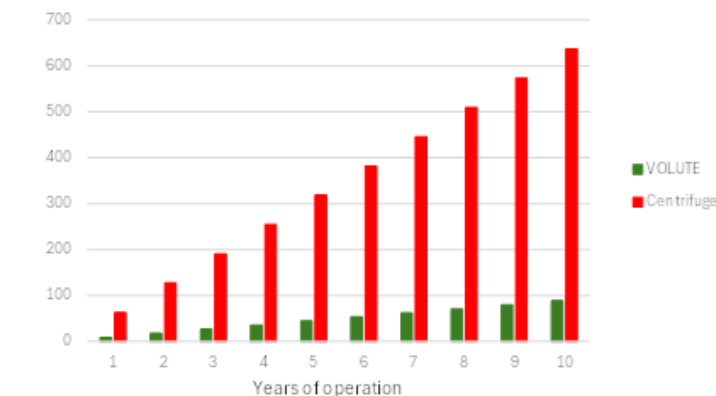
Price of energy consumed over 10 years of operation



Cumulative electricity consumption over 10 years of operation			
	VOLUTE™	375	MWh
	Centrifuge	2 688	MWh

Cumulative electricity costs over 10 years of operation			
	VOLUTE™	75 040	EUR
	Centrifuge	537 600	EUR

Calculated energy-dependent CO₂ emissions over 10 years of operation



Cumulative CO ₂ emissions over 10 years of operation		
VOLUTE™	89	t CO ₂
Centrifuge	637	t CO ₂

VOLUTE DUO™ vs Belt Press



ENERGY CONSUMPTION

Klampsess	kW (Maximum)	kW (Normal Operation)
Belt Drive	4.5	2.7
Hydraulic Pump	0.75	0.5
Polymer Pump	1.5	0.9
Washwater Transfer Pump	7.5	2.5
	14.25	6.5

VoluteDuo	kW (Maximum)	kW (Normal Operation)
Screw Motor	2.2	1.3
External Drive Motor	0.8	0.5
Agitation Motor	0.8	0.5
Polymer Pump	1.5	0.9
	5.2	3.1

*These figures indicate the VoluteDuo would be more energy efficient with an **estimated 75% reduction** when compared to the existing Klampsess.*

Site specifically, this would mean an estimated OPEX saving of approximately £11k per year (if the existing 2 Klampsesses were replaced with 2 VoluteDuo's) equating to a potential 20 Ton carbon (CO₂e) reduction.

*The cost savings are **based on energy savings and do not include the massive reduction in maintenance costs.***

CO ₂ e (Kg) (Klampsess)	CO ₂ e (Kg) (VoluteDuo)	CO ₂ e % Reduction	CO ₂ e Reduction (Ton)
13589.54	3302.92	75.7%	10.29

VOLUTE DUOTM vs Belt Press



Conclusions

The VoluteDuo trial has been very successful, and the benefits have been clearly demonstrated.

- Capable of achieving sufficient dried solids with the average being >28%.
- Solids capture rate exceeded expectations with the average being >98%.
- Simple in terms of daily operation and maintenance (**"night and day!" according to site operators**).
- 99.1% less wash water required (meaning reduced return liquors re-entering WWTP for treatment).

- More efficient due to potential energy savings with an estimated 75% reduction in power.
- Positive effect on the environment due to CO₂e reductions.

During the trial, the VoluteDuo did not encounter any breakdowns, however, there were 2 recorded breakdowns with the existing belt presses resulting in significant costs and downtime.

In terms of maintenance, the VoluteDuo has less moving serviceable parts and requires less cleaning when compared to the existing belt presses (each of which has 18 grease points, 1 motor requiring oil, 2 belts prone to failure, and takes 3 hours per day to clean).

"The VoluteDuo would without doubt be an ideal direct replacement for certain de-watering equipment."

VOLUTE GS field results

VOLUTE™ GS Series **Outperforms** Centrifuge in Municipal Sludge Dewatering Efficiency and at Significantly Lower Operating Costs



PROBLEM

The customer, a municipal wastewater treatment plant in Germany, had an old centrifuge that needed to be replaced. They were looking for a solution that would be similarly efficient, fully automated and, ideally, save on their recently rising operating costs.

SOLUTION

AMCON offered the VOLUTE™ GS series screw press with thickening flocculation unit (TFU), which allows its increased throughput of processed kg-DS/h and at the same time increases the dryness of the dewatered sludge cake.

The VOLUTE™ GS press achieved a cake dryness of 35.8 %-DSC, which according to the customer even exceeded the performance of his centrifuge. Also, thanks to the low screw speed and the self-cleaning system, the operating costs of the VOLUTE™ screw press were many times lower than those of the centrifuge (see energy consumption comparison below). The customer also appreciated the filtrate quality, as the filtrate capture rate was 99.2 %.

VOLUTE™ GS Series **Outperforms** Centrifuge in Municipal Sludge Dewatering Efficiency and at Significantly Lower Operating Costs



בעיה

ללקוח, מתקן טיהור שפכים עירוני בגרמניה, הייתה צנטריפוגה ישנה שהיה צריך להחליף אותה. הם חיפשו פתרון שיהיה יעיל באותה מידה, אוטומטי לחלוטין, ובאופן אידיאלי, יחסוך בעלויות התפעול שעלו לאחרונה.

פתרון

AMCON הציעה את מתקן הסחיטה הבורגי מסדרת **VOLUTE™ GS** עם יחידת הפתתה מעבה (TFU), המאפשרת תפוקה מוגברת של ק"ג נוזל לשעה מעובד ובמקביל מגבירה את יובש עוגת הבוצה המנוקה.

מכונת ה- **VOLUTE™ GS** השיגה יובש עוגה של - **35.8% DSC**, שלדברי הלקוח אף עלתה על ביצועי הצנטריפוגה שלו. כמו כן, הודות למהירות הבורג הנמוכה ולמערכת הניקוי העצמי, עלויות התפעול של מכבש הבורג **VOLUTE™** היו נמוכות פי כמה מאלה של הצנטריפוגה (ראה השוואת צריכת אנרגיה בהמשך). הלקוח העריך גם את איכות התסנין, שכן שיעור לכידת התסנין היה **99.2%**.

VOLUTE™ GS Series **Outperforms** Centrifuge in Municipal Sludge Dewatering Efficiency and at Significantly Lower Operating Costs



Machine comparison	El. consumption	Difference
Client's centrifuge	22.00 kW/h	-
VOLUTE™ GS press	1.67 kW/h	13x lower

Details:

Model:	GS-201
Sludge type:	Digestate WAS
Total solids:	2.20 %
Flow rate:	1.00 m ³ /h
DS throughput:	22.0 kg-DS/h
Cake solids content:	35.8 %
Capture rate:	99.2 %

1. Typical flocculation quality



3. Typical filtrate quality

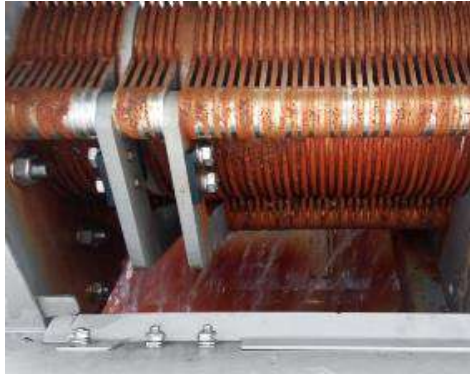


2. Sludge cake



VOLUTE DUO field results

Field test result no. 1



Test unit: RVP241

Test location: Czech

Industry type: Chemical

Sludge type: Chemically precipitated

Inorganic content: 79 – 90%

TS: 1 – 1.5%

Reached 16-24% DSC

- ✓ Catalogue throughput achieved
- ✓ No blockage at all
- ✓ Capture rate 94.2 - 99.8%
- ✓ 3ppm phosphorus limit in filtrate reached

Field test result no. 1

	Max Dryness	Best over-all
Total Solids (TS)	1.3 %	1.1 %
Inorganic Contents	89 %	80 %
Feeding DS Throughput*	16.1 kg-DS/h	18.5 kg-DS/h
Cake DS Contents	23.7 %	20.7 %
Suspended Solids Capture Rate	99.6 %	99.3 %



Field test result no. 2



Test unit: RVP241

Test location: Poland

Industry type: Plastic recycling

Sludge type: DAF

Inorganic content: 53%

Fiber content: 36%

TS: 0.95%



Reached 20 - 25% DSC

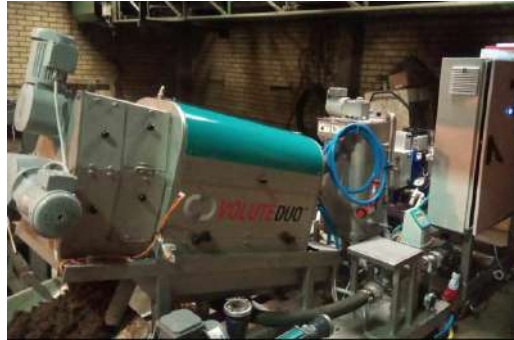
- ✓ Catalogue Throughput achieved
- ✓ No blockage at all
- ✓ Capture rate 97%

Field test result no. 2

	A Min. flow 27.07.21 morning	B Max flow 27.07.21 afternoon
Flow Rate	1.4 m3/h	3.4 m3/h
Total Solids (TS)	1.20 %	0.95 %
Total Suspended Solids (TSS)	8370 mg/l	6630 mg/l
Inorganic Contents	52.6 %	52.6 %
Fiber Contents	35.5 %	35.5 %
Feeding DS Throughput (TS Value)	16.8 kg-DS/h	32.3 kg-DS/h
Cake DS Contents	25%*	20%*
Suspended Solids Capture Rate	98%*	97%



Field test result no. 3



Test unit: RVP241

Test location: Sweden

Industry type: Paper production

Sludge type: WAS

Inorganic content: 11%

Fiber content: 29%

TS: 0.5%

Reached 18 - 24% DSC

- ✓ Catalogue Throughput achieved
- ✓ Replacing both DAF and belt press by one step
- ✓ No blockage at all
- ✓ Capture rate 99 - 100%

Field test result no. 3

	Optimal Dryness 03.03.21 14:05	Optimal Throughput 03.03.21 15:15	Best Overall 04.03.21 11:16
Flow Rate	2.9 m3/h	3.8 m3/h	3.4 m3/h
Total Solids (TS)	0.47 %	0.47 %	0.44 %
Total Suspended Solids (TSS)	3880 mg/l	3880 mg/l	3640 mg/l
Inorganic Content	11.3 %	11.3 %	8.5 %
Fiber Content	28.7 %	28.7 %	28.7 %
Feeding DS Throughput (TS Value)	13.6 kg-DS/h	18.0 kg-DS/h	14.9 kg-DS/h
Cake DS Contents	24.2 %	17.9 %	21.5 %
Suspended Solids Capture Rate	100 %	100 %	100 %



Field test result no. 4



Test unit: RVP241

Test location: Italy

Industry type: Meat processing plant

Sludge type: Digestate/WAS

Inorganic content: 14%

Fiber content: 28%

TS: 2.1%

Reached 16 - 21% DSC

✓ Catalogue Throughput achieved

✓ No blockage at all

✓ Capture rate 97 - 100%

Field test result no. 4

	A Best over-all 07.04.21 14:20	B Max dryness 08.04.21 11:05	C Max feed 08.04.21 11:55
Flow Rate	0.71 m3/h	0.52 m3/h	1.2 m3/h
Total Solids (TS)	2.0 %	2.1 %	2.2 %
Total Suspended Solids (TSS)	16070 mg/l	19330 mg/l	20000 mg/l
Inorganic Contents	14.1 %	14.0 %	15.3 %
Fiber Contents	27 %	28 %	28 %
Feeding DS Throughput (TS Value)	14.3 kg-DS/h	11.1 kg-DS/h	25.9 kg-DS/h
Cake DS Contents	19.3 %	21.1 %	16.2 %
Suspended Solids Capture Rate	97 %	100 %	100 %



Field test result no. 5



Test unit: RVP241

Test location: Sweden

Industry type: Meat rendering

Sludge type: Raw Wastewater

Inorganic content: 8 – 16%

Fiber content: 4 – 12%

TS: 7%

Reached 23-29% DSC

- ✓ Catalogue Throughput achieved
- ✓ No blockage at all
- ✓ Capture rate 94 – 99.6%

Field test result no. 5

	Best filtrate 04.02.21 18:35	Max capacity 04.02.21 16:35	Min polymer 04.02.21 20:00
Total Solids (TS)	7.0 %	6.8 %	6.9 %
Total Suspended Solids (TSS)	61800 mg/L	42300 mg/L	42200 mg/L
Inorganic Contents	15.7 %	8.3 %	12.0 %
Fiber Contents	12.3 %	5.7 %	4.1 %
Feeding DS Throughput*	15.3 kg-DS/h	17.9 kg-DS/h	15.5 kg-DS/h
Cake DS Contents	29.0 %	29.3 %	23.9 %
Suspended Solids Capture Rate	99.6 %	94.3 %	94.4 %



Field test result no. 6



Test unit: RVP-501

Test location: Netherlands

Industry type: Plastic Recycling

Sludge type: DAF

Inorganic content: 26%

Fiber content: 16%

TS: 5-11%

Reached 40-49% DS

- ✓ Catalog throughput reached
- ✓ No clogging
- ✓ Capture rate 95-99%
- ✓ With direct feed from the DAF, no need for polymers for sludge dewatering

Field test result no. 7 (VOLUTE vs VOLUTE DUO)



Test unit: RVP-241 vs FS-201

Test location: Belgium

Industry type: Food Industry

Sludge type: DAF

Inorganic content: 0%

Fiber content: 16%

TS: 4-5%

	RVP-241	FS-201
DS :	12%	14.7%
Throughput:	37 kg-DS/h	50-64 kg-DS/h
Capture Rate :	>99%	>99%

Note: The greasy sludge was difficult to press by the double screw due to lack of inorganic matter → Volute FS performed better

Field test result no. 8



Test unit: RVP-241

Test location: Italy

Industry type: Pharma Industry

Sludge: Magnesium oxide and Snail slime

Inorganic content: 78%

Fiber content: 0%

TS: 0,5%

Reached 29,8% DS

- ✓ No clogging
- ✓ Capture rate 97,4%

Field test result no. 9 (VOLUTE vs Centrifuge)



Test unit: RVP-241

Test location: Czech Republic

Industry type: Food Industry, Dairy

Sludge type: DAF

Inorganic content: 21%

Fiber content: 7%

TS: 5%

Reached 23,2% DS with throughput 50 kg-DS/h

- ✓ No clogging
- ✓ Capture rate >95%
- ✓ Low polymer dosage 3-4,6 g/kg DS

Field test result no. 9 (VOLUTE vs Centrifuge)

Type	*Designed Capacity	Power consumption
Tested RVP-241	0.5-1m3/hr	0.87 kW
Existing Centrifuge	1.5-1.8m3/hr	22kW
RVP-501	2-4m3/hr	1.86 kW
FS-302	2-4m3/hr	1.11 kW
FS-351	2-4m3/hr	1.87 kW



Field test result no. 10



Test unit: RVP-241

Test location: Belgium

Industry type: Civil Engineering, drilling

Sludge type: Primary, clay, sand

Inorganic content: >90%

TS: 12%

Reached 45% DS

- ✓ No clogging
- ✓ Capture rate >97%

Questions?
