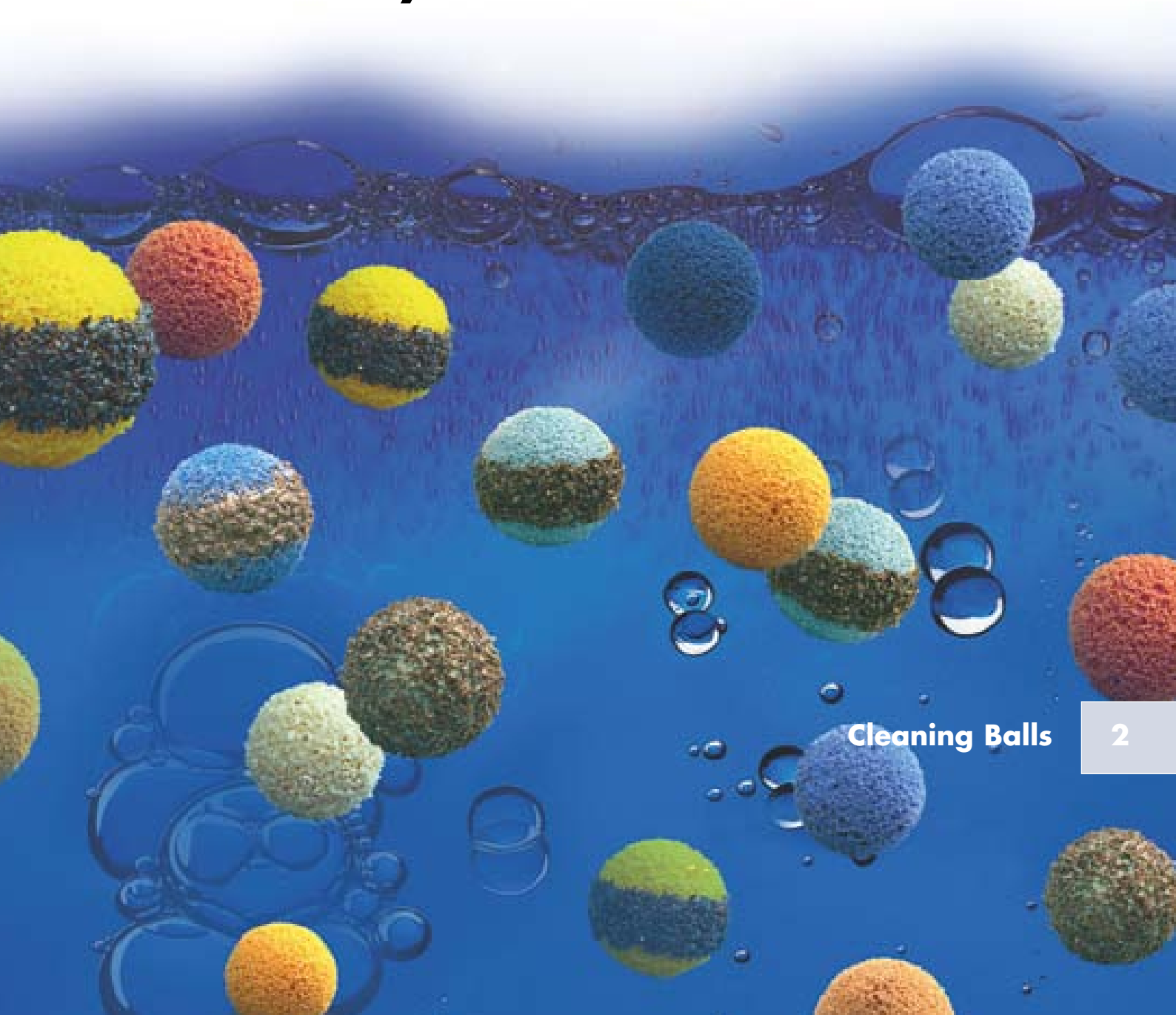
IN-TA-CT®

Cleaning Balls

HMA FLOW & INDUSTRIAL

Taprogge

Pure Efficiency



Taprogge Cleaning Balls

EFFICIENCY IN THE SHAPE OF A BALL

TAPROGGE cleaning balls form the process-technological basis of our tube cleaning systems. To yield the maximum benefit of a TAPROGGE system, it is important to select the adequate cleaning ball and its optimal operational mode. For every tube material, every type of cooling water and debris, as well as the plant-specific hydraulic conditions, place special demands upon the relevant ball. Our integrated service concept IN-TA-S® provides you with the safety always to work with the optimal cleaning ball. IN-TA-S® is based upon our know-how in application technology, gathered by the operation of more than 10,000 TAPROGGE systems.

Support

IN-TA-S® centres in 10 regions the world over provide you throughout the year with all that is necessary for the right ball selection, its timely availability, and the optimized operation of a tube cleaning system.

Special TAPROGGE programmes ensure the professional management of your requirement. The result: transparent evaluation of needs, stockpiling at favourable cost, as well as timely availability of the parts on site.

Of course, you may also receive optimization support by remote monitoring and control of your systems from our IN-TA-S® Remote Centre. This is particularly fast and cost-saving.

Benefit

How much the right ball selection and continued optimization by TAPROGGE experts translates into thermal and financial benefits is shown by the following practical example:

For a power station with 300 MW turbine capacity and 6,000 base load hours per year, a turbine efficiency gain of 1 % and more can be reckoned with, which - given an electricity price of 0.03 € per kWh - results in economies of 540,000 € per year. If, for reasons of faulty ball selection or insufficient ball optimization, the efficiency gain is only 0.9 %, the annual economy is only 486,000 € - which is by 54,000 € less than in case of optimal recommendation. Conclusion: the optimal ball selection magnifies the benefit to millions (based on the total lifetime of the power station).

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INTERESTING FACTS AROUND THE CLEANING BALL

Ball Selection and Optimization

For the determination of the type of cleaning ball and the mode of operation, TAPROGGE uses special in-house software that reflects the application experience of meanwhile more than 5,000 TAPROGGE cleaning systems. Essential parameters of calculation are: tube material, tube geometry, water velocity and temperature, water biology and chemistry, as well as hydraulic and design data of the installed system.

If necessary, those calculating instruments are complemented by the special, additional IN-TA-S® modules:

- diagnostics on site (condenser inspection and ball distribution tests)
- diagnostics in the TAPROGGE Technological Centre (tube examination)
- consultancy in application engineering (with solutions to special questions of fouling, scaling, and corrosion), and performance of client-specific schemes (abrasive ball cleaning, ferrous sulfate dosing, monitoring of cooling tube conditions).

Available Range of Cleaning Balls

TAPROGGE's standard range of products includes balls in diameters from 14 - 44 mm. Approx. 6 million cleaning balls are permanently ready for delivery. Other sizes can be supplied on request.

Ball Types and Tube Material

The different tube materials tend to typical appearances of fouling, scaling and corrosion. The ball types respond to those appearances by their recipes and coatings. The following assignments are usually made:

- for CuNi and brass tubes:
  - P150 (standard), S160 respectively. To optimize the ball distribution: addition of 50 % P130
  - L160 and PL130 for prolongation of ball lifetime
  - P150 / PL150 with rough tubes
- for tubes of stainless steel and titanium:
  - P150, G100 resp.
  - short-term application of T160 / T300
- for seawater desalination plants:
  - Heat-resistant balls S200 and S220
- for air conditioning plants:
  - irrespective of tube material: S110

Nominal Ball Diameter

The nominal ball diameter depends on the inner tube diameter and the cooling water velocity within the tubes. The nominal ball diameter exceeds the inner tube diameter by 1 to 3 mm.

Ball Hardness Degree

The degree of hardness of the cleaning ball is determined in dependence on the water velocity in the tube, the gap width of the strainer section, and the screen angle.

Cleaning Frequency

Proven successful with stainless steel and titanium tubes has an average cleaning frequency of 12 cleaning balls per hour and tube. Detailed, basic recommendations for the specific ball types are given on the following pages.

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INTERESTING FACTS AROUND THE CLEANING BALL

Ball Distribution

The distribution of the cleaning balls and thus the cleaning frequency of the individual cooling tubes are influenced by the ball distribution in the cooling water inlet pipe, the flow conditions in the waterboxes and especially by the properties of the TAPROGGE balls adapted to those parameters. Through mixtures of different ball types with adjusted sinking velocity the distribution is optimized even further.

Ball Lifetime

Essential factors of influence for the ball life are: tube roughness, degree of fouling of the tubes, as well as type of fouling. That is why the degree of wear of a cleaning ball fluctuates between a few days and approx. 4 weeks, depending on tube condition.

Ball Nomenclature (Example)

27 - S 16 0 - 3

- Nominal ball diameter (mm) 27
- Ball type S = sponge ball
- Ball recipe no. 16 = dark blue
- Ball Ø field of tolerance 0 = 27 $^{-0}_{+1}$ = 27 – 28 mm
- Hardness degree (elasticity) 3 = medium

Ball type (sponge rubber ball)	Rubber recipe (Colour)	Ball Ø field of tolerance (in mm)	Hardness degree (elasticity)
G = plastic granulate ball	11 = green	0 = $^{-0}_{+1}$ (standard)	1 = soft
L = long life ball	13 = orange	1 = $^{-0}_{+0,5}$ *	2 = medium/soft*
P = polishing ball (standard ball)	15 = brown	2 = $^{+0,5}_{+1,0}$ *	3 = medium
R = ring-coated corundum ball	16 = dark blue		4 = medium/hard*
S = sponge ball	20 = blue		5 = hard
T = totally coated corundum ball	22 = red		6 = extra hard*
	30 = light brown	* special balls	* special balls

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Taprogge Cleaning Balls

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TAPROGGE CLEANING BALLS FOR ALL TYPES OF COOLING WATER WITH TEMPERATURES OF UP TO 80°C

Standard cleaning ball with addition of polishing agent

• Application:	with tubes of stainless steel, titanium, brass, copper (especially with cooling surfaces which tend to develop rough surfaces
• Cleaning frequency:	
- with stainless steel and titanium tubes:	12 balls/hour and tube
- with copper and brass tubes in fresh water (<1000 µS/cm):	12 balls/hour and tube
in brackish water (>1000/<10,000 µS/cm):	examination required
in seawater without $FeSO_4$ dosing:	6 - 12 balls/day and tube
in seawater: with $FeSO_4$ dosing:	from 6 - 12 balls/day and tube to 6 - 12 balls/week and tube
• Special feature:	The ball is applied as standard ball

1 P150 PL150

Cleaning ball with addition of polishing agent and reduced sinking velocity

• Application:	with stainless steel, titanium, brass and copper tubes
• Cleaning frequency:	see (1)
• Special feature:	ball sinking velocity lower than with P150 / PL150

2 P130 PL130

Cleaning ball for copper and brass tubes

• Application:	with copper and brass tubes (especially also in combination with ferrous sulfate dosing)
• Cleaning frequency:	see (1)

3 S160 L160

Cleaning ball especially for the application in heat exchangers of air conditioning plants

• Application:	for all tube materials, especially with heat exchangers of air conditioning plants
• Cleaning frequency:	as per case-specific recommendation

4 S110

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TAPROGGE CLEANING BALLS FOR ALL TYPES OF COOLING WATER WITH TEMPERATURES OF UP TO 80°C

5 G160

Standard cleaning ball with plastic granulate coating

- Application: with particularly strong biofouling in tubes of stainless steel, titanium and brass
- Cleaning frequency:
  - with stainless steel and titanium tubes: 12 balls/h and tube
  - with copper and brass tubes: see (1)
- Recommendation: With stainless steel and titanium tubes, 25 % of the balls are to be exchanged weekly against new balls.

6 R160

7 R300

Cleaning ball with coated corundum ring

- Application:
  - with hard scaling (e.g.: calcite, sulfates, silicates)
  - with corrosion products
  - with thickened and dried cooling water residues after condenser draining
  - for basic cleaning of new cooling tubes and before/after condenser draining (surface smoothing)
  - for eliminating porous cover films (e.g. with $FeSO_4$ dosing)
  - with strong biofouling (short-term application)
- Cleaning frequency: cleaning frequency and number of balls must be determined through tests by TAPROGGE
- Special feature: sinking velocity of the R300 ball lower than of R160.

8 T160

9 T300

Cleaning ball with corundum coating on the total surface

- Application: see items 6 and 7
- Special feature: the T300 ball has a lower sinking velocity than the T160 ball and is applied as an addition to optimize the ball distribution in the condenser.
- Cleaning frequency: see items 6 and 7

Due to its larger surface contact the T type corundum ball cleans the tubes faster and more evenly than the R type ball. On the other hand, the application of the R ball is advisable with harder deposits because of its higher contact pressure. As to its application with stainless steel and titanium tubes, this is safe with regard to material wear and tube corrosion. The microscopically visible scoring resulting thereof is even smaller than the scoring that originates from the production of the tubes. For copper-alloy tubes, the aspects of cover film formation in the tubes are to be considered.

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Taprogge Cleaning Balls

TAPROGGE CLEANING BALLS FOR ALL TYPES OF COOLING WATER WITH TEMPERATURES BETWEEN 80°C AND 120°C

Standard cleaning ball for high temperatures	
• Application:	for high temperature operation (80°C - 120°C), particularly in evaporators of seawater desalination plants
• Cleaning frequency:	2 balls/hour and tube with a ball number of 30 % of the tubes of the 1st evaporator stage
• Special feature:	The balls are used in hardness degrees 3 (medium) and 5 (hard)

10 S200

Cleaning ball for high temperatures	
• Application + cleaning frequency:	see item 10
• Special feature:	Sinking velocity lower than of balls of items 9 and 10

11 S220

Cleaning ball for high temperatures with corundum coating	
• Application:	- with hard scaling - for basic cleaning of new condenser tubes and before/after evaporator draining in cold operation
• Cleaning frequency:	as per case-specific recommendation, after relevant tests by TAPROGGE, respectively

12 R200

13 T200

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