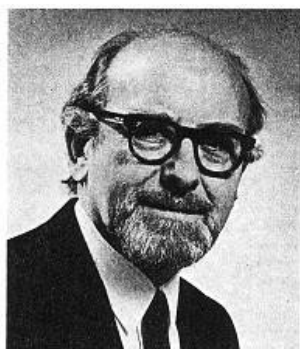




Guide to DPD Testing in Pools and Spas

Application Support Information

When and how to use the DPD method in Pool & Spa?



Dr A.T. Palin, OBE

Pool operators need to be confident that the sanitizer concentration is correctly dosed and controlled, for the health and comfort of bathers. Disinfection of swimming pools is usually achieved using chlorine and adequate free chlorine is needed to prevent infections, while eye irritation is minimized by keeping the combined chlorine residual as low as possible.

The well-established DPD method, developed by Dr A.T. Palin (originally called the Palin System) is the test procedure of choice for free, total and combined chlorine, but also bromine and ozone due to its consistency and reliability.

Disinfection treatments measured with DPD

Chlorine is used as a primary disinfectant because of its effectiveness in killing potentially harmful organisms. It forms hypochlorous acid in the pool water whose effectiveness at disinfecting is influenced by the other chemicals that are in the pool, primarily pH and the amount of bather waste.

- Hypochlorous acid that hasn't reacted with bather waste is "free chlorine" and must be carefully monitored in order to guarantee a safe pool.
- Hypochlorous acid that reacts with bather waste forms "combined chlorine" which reduces its power to disinfect and is also associated with the unpleasant smell and irritation of eyes and nose that can occur in pools. "Combined chlorine" results from the reaction between ammonia-based compounds from bather waste and chlorine to form monochloramine, then dichloramine. Learn more [here](#)

Ozone is also used as a primary disinfectant and must be efficiently and sufficiently dissolved into the pool water to carry out the required oxidation and disinfection. Although ozone is a powerful disinfectant, adequate residuals of ozone must be

maintained in the pool water to ensure full control. It is very often used with chlorine or bromine as a secondary disinfection method due to the difficulty in maintaining constant residual.

Bromine can be used as a disinfectant alternative for chlorine, especially in spas and hot tubs. The bromamines which are formed when bromine is added to pool or spa water are as effective as free chlorine in killing pathogenic microorganisms and do not give off odours. Therefore, Total Bromine is the key parameter to monitor.

The Palintest DPD method



The DPD indicator, an abbreviation of diethyl-p-phenylene diamine, is available under different forms: powder, liquid and tablets. Dr Palin spent the initial part of his career at Palintest developing the DPD system, firstly as a liquid and then as convenient tablets numbered 1 to 4. Tablets are easier and safer

to handle, for convenient dosing and optimum storage.

All forms of DPD react with pool water containing chlorine, bromine or ozone, colouring the water sample in various shades of pink: the deeper the colour, the higher the concentration of sanitizer. The DPD method is based on measuring the intensity of colours produced by the reaction between reagents in the DPD tablets with the sanitizers to be measured in the water. Visual colorimetric techniques will help to translate the intensity of colours into values using calibrated colour charts. However, photometers can digitally analyse the colour generating results with more accuracy by referring to calibration data stored in the instrument memory.

DPD Tablets

The principal tablets of the Palin System are numbered 1 to 4 as follows in Table 1.

Table 1: DPD tablets

Tablet	Contents	Parameter to measure
DPD 1	DPD indicator plus buffer	Free Available Chlorine
DPD 2 (use with DPD 1)	Stabilized KI for monochloramine activation	Combined Chlorine
DPD 3 (use with DPD 1)	Stabilized KI for dichloramine	Total Chlorine
DPD 4	All reagents in a single tablet	Total Available Chlorine

Additional tablets used in supplementary procedures are given below:

- DPD Acidifying
- DPD Neutralizing
- DPD Glycine

DPD tablets given in Table 1 can also be used when measuring alternative disinfectants such as bromine or ozone.

DPD methods to measure the different relevant sanitizers in the pool water with the Palintest range of products are summarized in Table 2.

Table 2: What can DPD measure?

Chemical	Parameter tested *	Tablets DPD required	Comments
Chlorine	Free Chlorine	1	Result in mg/l Chlorine
	Total Available Chlorine	4	Result in mg/l Chlorine , Or 1 + 3 together
	Free Chlorine only Total Available Chlorine Combined Chlorine only	1 3	A Result in mg/l Chlorine B Result in mg/l Chlorine Combined Chlorine mg/l Chlorine = B - A
	Free Chlorine only Monochloramine only Dichloramine only	1 2 3	A Result in mg/l Chlorine Monochloramine = B Result in mg/l Chlorine with DPD 2 - A Dichloramine = C Result in mg/l Chlorine with DPD 3 - B
Bromine	Bromine PLUS Bromamine	1	No need to differentiate between both, as both have disinfectant properties
Bromine and Chlorine	Bromine only Bromine PLUS Free Chlorine Bromine PLUS Total Available Chlorine Total Available Chlorine Combined Chlorine only	Glycine* +1 1 + 3 (need 1)	A Result in mg/l Bromine B Result in mg/l Bromine, Free Chlorine mg/l = 0.44 * (B - A) C Result in mg/l Bromine Total Chlorine mg/l Chlorine = 0.44 * (C-A) Combined Chlorine mg/l Chlorine = 0.44 * (C - B)
Ozone	Ozone only	4	Result mg/l Ozone

The Palintest DPD System ensures effective sanitation and guarantees a positive experience for the bather. For further information please visit our website at www.palintest.com or contact support@palintest.com if you require technical assistance.