Introduction

Product datasheets (PDS) supply a lot of information about how our coatings can be used, how they should be applied and how long it will take before they can be taken into service for instance.

Some of the information is related to the (planning of) application, such as spreading rate, drying properties and required equipment. Others, such as volatile organic compound content are regulatory in nature and may be relevant for (work) permits and interpretation or requirements vary around the globe and even between locations.

Information on physical properties of the wet paint material and the dry coating film that is relevant for the user can be found on the product datasheet.

- Physical properties: Volume Solids, Spreading rate, Specific Gravity or Density, Flash Point, VOC, pot life, texture / gloss, mix ratio
- Application planning: time related properties of the products that affect scheduling and planning during application: induction time, pot-life and drying/curing-times such as touch-dry, hard-dry and full cure as well as recoating intervals
- Variables and calculations: wet and dry film thickness and spreading rate explained
- Additional terminology: application losses, drying/curing, units

Additional information that may be required for planning your application can be found in safety datasheets (SDS) for the components and for some products the separate application guidelines.

Physical properties

Volume solids The volume solids figure (VS%) given on the product data sheet is the percentage of the wet film, which remains as the dry film after evaporation of solvents and curing. The value is obtained from a given wet film thickness under specified application method and conditions. These figures have been determined under laboratory conditions (practical value) or calculated from the formula contents (theoretical value). As the value will be dependent on climate conditions during drying and the applied film thickness, the actual value in practice will vary within ±2% from the value stated in the datasheet.

Spreading rate The area that can theoretically be coated with a product at a specified thickness is called the spreading rate. This value can be used in calculating the required volume of paint for a certain paint project. Besides the values mentioned in the tables this can also be calculated based on the volume solids and specified thickness. As with wet and dry film thickness calculations, the loss factor determines the practical use.

Density The density or specific gravity (SG) is the weight of a material per volume measure (and can be expressed in g/ml or kg/l). The density for two-component products is given for the mixed product. In all cases this is the value without the addition of thinner. In practice, the density may vary in an interval of a few percent compared to the theoretical value indicated in the product data sheet (slight batch to batch variations and differences between shades of the same products occur).

Flash point The minimum temperature at which a product, when confined in a Setaflash closed cup, must be heated for the vapours emitted to ignite momentarily in the presence of a flame (ISO 3679:1983). Adding thinner can affect the flash point, data on the PDS is given without the use of thinner. Flashpoint for the thinner may be found in the relevant SDS.

VOC Volatile Organic Content (VOC) is the weight of organic solvent per litre of paint. Legislative requirements differ from country to country, and from region to region, and are constantly being reviewed.

The values quoted have been obtained from a combination of laboratory tests, and application trials, and refer to the time periods under which satisfactory coating performance will be achieved. Please note that application of any product after the working pot life has been exceeded will lead to inferior product performance, and must not be attempted, even if the material in question appears liquid in the can. Adding thinner to extend the pot life is not advisable.

Texture / Gloss Under Texture Transocean datasheets mainly indicate the typical gloss values. These have been determined in accordance with ISO 2813 (= ASTM D-523) using a 60° gloss angle. The categories used in the data sheet are:

Finish	**Gloss units** (at 60° angle)
Matt	0-20
Semi-Gloss	20-60
Gloss	60-80
High Gloss	>80

Do note that the gloss level will be dependent upon a number of factors such as application conditions and technique used as well as the condition of the surface to be coated.

Note on gloss and colour retention:

The initial gloss and shade as mentioned on the datasheet do not indicate gloss and colour retention over time. In service, coatings are affected by (sun)light and (especially epoxy products) can display chalking and possibly yellowing in outdoor exposure. This is a general effect for the type of chemistry used and does not affect the anti-corrosive performance of the coating.

Mix ratio The mix ratio given for multi component products are the volumes ratios in which the components of these products are supplied and that are to be mixed before application and before adding any thinner (if allowed). For example 16L of base or A component and 4L of hardener, cure or B component make 20L of mixed set at 80:20 volume mix ratio.

In some cases, a short or fractional ratio may (also) be given. For example 8:1 (87.5:12.5), 5:1 (83.3:16:7) or 4:1 (80:20).

For twin-feed applied products (where material is not mixed in the drum but after the pump or at the spray gun), it is very important that right ratio is maintained but deviations up to max. 3% are acceptable unless otherwise stated on the specific PDS.

Products for twin-feed application generally supplied ready for use after mixing of components and use of thinner is not allowed.

Application planning:

Induction time If mentioned on the product data sheet the coating should be thoroughly mixed and left for the recommended time for the particular temperature conditions at application. This induction time or pre-curing of the product ensures that the coating will give the required performance and application properties.

Pot life The maximum time during which the multi-component product should be used after the components have been mixed together at the specified temperature. The practical pot-life may be visible as an increase in viscosity making it harder to spray. However, this is not the case with all products and for certain products the curing properties and quality of the fry film is affected without a visible change in the wet material.

Drying times

The drying times quoted in the product data sheet have been determined in the laboratory using a typical dry film thickness, the ambient temperature quoted in the relevant product data sheet. The drying times achieved in practice may show some slight fluctuation, particularly in climatic conditions where the substrate temperature differs significantly from the ambient air temperature.

Touch Dry The surface drying state of a coating when small glass spheres can be lightly brushed away without damaging the surface of the coating.

Hard Dry The condition of the film in which it is dry throughout its thickness. This through drying state is determined by the use of a thumb which, under specified pressure, torsion and time, does not mark or damage the film.

Full cure In case of two-pack coatings where drying is the result of a chemical reaction, hard dry in general does not refer to the end of the curing reaction. The curing process leads to the build of a cross linked network, which is essential in fulfilling the products intended use. Full cure times therefore refers to the minimal curing time required under the specified conditions to develop the full performance properties of the product.

Recoating Intervals

The product data sheet generally states both a “minimum” and a “maximum” recoating time in so called re-coating tables. The recoating interval and the figures quoted at the various temperatures are intended as guidelines, consistent with good painting practices.

Minimum The minimum recoating time stated is an indication of the time required for the coating to allow the application of a further coat of paint providing that the following conditions are met:

- the coating has been applied at the normal recommended thickness and application conditions were as recommended. Over application will for many coating products extend the minimum overcoating time and in some cases DFT limitations are given with a re-coating table.
- the paint used for recoating is suitable for the purpose, i.e. compatible
- If the above conditions are not met, the quoted minimum recoating times are liable to variation and will invariably have to be extended.

Maximum The maximum recoating time indicates the allowable time period within which recoating should take place in order to ensure acceptable inter-coat adhesion is achieved provided that the following factors have been taken into account:

- the coating has been applied in accordance with good painting practices and at the specified film thickness.
- the condition of the coating to be overcoated must be in intact, tightly adherent, clean, dry and free from all contaminants. For example, the rough textured surface of an MIO may require “extensive” cleaning, especially in an industrial and/or coastal environment.

  coatings having a glossy surface which could have a detrimental effect on the adhesion of subsequent coats should be treated by light surface abrasion, sweep blasting, or other suitable processes which will not cut through or detract from the performance of the underlying coating.

Application methods and equipment

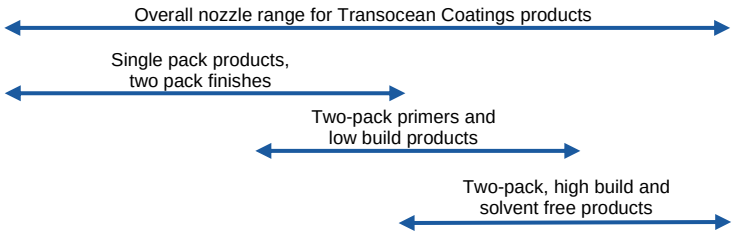
Most Transocean Coatings products are designed to be applied by (airless) spray methods, while use of brush and roller may be possible for touch-up and smaller areas. The datasheet will indicate the preferred methods and the type and amount of thinner that may be required for specific methods. To create optimal flow and even film thickness it is important to use the right technique, equipment and settings.

Pressure For airless spray, this may vary between 100 and 250bar (approx. 1450 – 3600psi) at the spray nozzle. The type of pump to generate this pressure depends on several variables and generally the datasheet will not mention pump details: number of spray guns per pump, hose length, working height above the pump and viscosity of the paint material.

Nozzle Airless spray nozzles are generally identified by the numbers of their opening size and fan angle. Coding varies by supplier and colour coding may be used to further differentiate.

Nozzle size Opening or aperture size is commonly expressed in ‘thou’ or $^{1}/_{1000}$ of an inch. Tables such as below are available to convert imperial (inches or thou) to metric (mm). Larger opening sizes are generally used when spraying higher viscous (thicker) materials.

'Thou' *	11	13	15	17	19	21	23	25	27	29	31	33	35	37
Inches	0.011	0.013	0.015	0.017	0.019	0.021	0.023	0.025	0.027	0.029	0.031	0.033	0.035	0.037
mm	0.28	0.33	0.38	0.43	0.48	0.53	0.58	0.64	0.69	0.74	0.79	0.84	0.89	0.94



Nozzle angle Optimal fan angle depends a lot on the type of object being coated (small angles for small or complex structures, large angles for larger flat areas. A larger angle covers a wider area on the substrate (compared to a small angle at the same spray distance). Using too large an angle can result in a lot of material loss and overspray. As not every product atomises properly using small angle nozzles, the datasheet indicates a range, mostly 40° - 80°. Outside of this range, optimisation of pressure, thinner and spray technique may be required to create proper atomisation and flow.

More information about paint application can be found in the Transocean Coatings “Guidance to paint application” information document which can be downloaded from our website.

Application conditions

Unless mentioned separately*, the relative humidity should be below 90% during application and curing. The temperature of the substrate should be min. 5°C and at least 3°C above the dew point of the air. Temperature and relative humidity should be measured in the vicinity of the substrate.

For specific products there may be a minimum relative humidity mentioned on the datasheet or separate application documents. Moisture curing products like zinc silicates will cure significantly slower below 50% relative humidity and not cure significantly below 30% relative. For water-based products, the drying stage may be affected by very low as well as high relative humidity and film defects may occur.

Please check the Transocean Coatings “Guidance to Paint Application” or product specific documentation for specific limitations.

Variables and calculations

Our products are specified for specific use and hence some of the numbers mentioned are ranges. A products may be used at a certain thickness in one environment and a higher thickness may be specified for other parts. This impacts the overall consumption

Film thickness

DFT / WFT The dry film thickness (DFT) is the number that is used to describe the required thickness of the coating after drying and/or curing. in the coating specification, expressed in micro-meters (µm, $^{1}/_{1000}$ of a millimetre). DFT and wet film thickness (WFT) are closely related.

Wet film thickness (WFT) indicates the initial thickness of the wet paint applied to the substrate. Dry film thickness (DFT) refers to the thickness of the film after drying and curing. A products’ percentage solids by volume (VS%) can be read from the relevant PDS. Once this is known and corrected for the used amount of thinning (see below under thinning), the required wet film thickness to be achieved for a specified DFT can be calculated:

$$\mathrm{DFT} = \frac{\mathrm{WFT\ x\ VS\%}}{100} \qquad \mathrm{WFT} = \frac{100\ \mathrm{x\ DFT}}{\mathrm{VS\%}}$$

Wet film thickness can be measured with a wet film comb-gauge immediately after application. Note that the steps in wet film thickness given by this type of gauge (of 25-100µm depending on the range and manufacturer) mean this is an indicative value.

90/10 rule The 90/10 rule is used as a quality control rule to ensure low film thickness parts do not make up large parts of the coated area. The rules states 90% of the recommended DFT is acceptable for up to 10% of the readings only, whilst for individual layers the minimum DFT should not be lower than 80% of the recommended DFT, and must form a closed film.

Maximum For economic and technical reasons, the applied thickness should not exceed 2x the thickness specified on the PDs on peaks overlaps. Specific products may have different limitations mentioned on the PDS.

Note: the practical film thickness achieved during application is impacted by many factors that are captured under the explanation of the Loss Factor in the "Additional terminology" chapter below. As the loss factor varies, it is not given on the product datasheet.

Additional terminology

Loss Factor The losses encountered vs. the theoretical values for spreading rate can be expressed as a percentage of the paint consumed. This includes material left in the drum and hoses of spray equipment to material spillage or missing the substrate due complicated designs and small dimension parts.

As described in our coverage & spreading rate document, each application technique has its own expected loss factor

- brush or roller — typical loss factor: 10-15%
- conventional (air) spray — 50% is no exception
- airless spray — usually 30% is assumed

Other loss factors are roughness of the substrate (5-20% loss), uneven application (5-10% loss) and windy conditions (dependent on the wind force may range from 5 to above 30% losses).

Introduction of the loss factor in the calculation leads to the terms practical spreading rate (m^2 /l) and finally to the practical consumption (l/m^2).

It is should be clear that the loss factor always is an estimation based on the local conditions, the experience of the painter and many other factors.

Drying / Curing Drying is the physical process of water or solvent evaporating form the applied wet paint. Curing is a chemical process where a reaction between coating components or with moisture or oxygen from the air results in (further) hardness development and other property changes.

For many products, even those not described specifically as physical drying, the drying process by itself will result in a film that is dry enough to be touched. This film still requires the curing to be completed before the film meets its designed performance parameters such as hardness and chemical resistance.

More about this type of terminology can be found on our website and in the separate paint technology document we share there.

Units Transocean Coatings generally publishes all documents in SI units (using the "*metric system*"): using (square) meters and micro-meters (µm), grams or kilograms, litres and so on. On our website we share a document on calculating equivalent values in imperial and/or United States customary units such as feet, mills (thousands of an inch) and pounds. If your projects requires documentation in other than metric units, please contact our central office or your Transocean Representative.

Further questions

In case of further questions on definitions and terms used in Transocean PDS, contact your Transocean Coatings representative.