YUASA

DOCUMENT: QAT02-X

NP RANGE OF PRODUCTS

There is only one central design authority within Yuasa, which is based at Yuasa Corporation, Japan. This authority sets the thresholds for performance and quality that has to be achieved for any of the Yuasa brands irrespective of where in the world they are manufactured. **Without this approval, the product cannot carry the Yuasa brand.**

Therefore, the technical characteristics of NP products manufactured world-wide conform to one common set of specifications as shown in the NP Design Manual.

DOCUMENT: QAT02-H

SHELF LIFE, SELF DISCHARGE AND TOP CHARGING

All lead acid batteries self discharge whilst in storage and if they are stored in a discharged condition for an extended period of time, then a layer of lead sulphate will be formed on the negative plates of the batteries. This phenomenon is referred to as "sulphation". Since lead sulphate is an insulator, it has a direct detrimental effect on charge acceptance. As storage time is extended the degree of sulphation becomes more advanced and consequently charge acceptance will be further reduced.

NP batteries are designed to have a very low self-discharge rate of approximately 3% per month, but it should be noted that the self-discharge rate varies according to the ambient storage temperature. Consequently the shelf life is reduced at higher temperatures. NP batteries have a 12-month shelf life at 0°C to 20°C; 9 months at 21°C to 30°C; 5 months at 31°C to 40°C, and a shelf life of only 2.5 months at 41°C to 50°C. So, in order to extend storage life, lead acid batteries should be stored in a cool, dry place.

If lead acid batteries are to be stored for an extended period of time it is recommended that they be given a top charge periodically. The recommended top charging procedure for a 12 volt battery is at between 14.4 to 14.7 volts for 10 to 20 hours. The voltage applied must be appreciably higher than the normal float voltage in order to break down any sulphation. At this level of charging voltage the maximum current should be less than one quarter of the battery's nominal capacity. For example, less than 700 milliamps for an NP 2.8-12 or less than 6 Amps for an NP 24-12. In practice a current of about one tenth of battery capacity is usually adequate, so that, for example, ten NP 2.8-12 could be charged in parallel from a 3 amp 14.5V charger. It should be noted that full capacity of the NP battery is retained when the battery is top charged to our recommendations.

DOCUMENT: QAT02-S

FLOAT SERVICE LIFE OF NP BATTERIES

We confirm that the NP batteries are designed to operate in standby (float) service for approximately 5 years, based upon a normal service condition in which float charge voltage is maintained between 2.25 and 2.3 volts per cell in an ambient temperature of approximately 20°C.

Length of service life will be directly affected by the number of discharge cycles, depth of discharge, ambient temperature and charging voltage.

High temperatures will require compensation of the float voltage by reducing the volts per cell by 3 millivolts by degree C, from the reference of 20°C. In practice a typical float setting of 13.6 volt for a 12 volt battery suffices for a temperature range of 10°C to 32°C. This compensation of float voltages at high temperatures is necessary to prevent overcharging.

High temperatures, even if the charging voltage is temperature compensated, will accelerate the ageing process of batteries. Consequently although a 5 year life may be expected at 20°C, a life of only 4 years may be expected at 30°C and only 2 years at 40°C.

DOCUMENT: QAT02-P

ENVIRONMENTAL SAFETY OF NP BATTERIES

A. NP series batteries do not give off gases during normal float standby operation.

B. The electrolyte is suspended in microfine glass fibre plate separator material which prevents leakage or spillage of electrolyte even if accidental damage occurs to the cell box.

C. The batteries are equipped with a safe low pressure venting system which when coupled with the extraordinarily high recombination efficiency make NP batteries the safest valve regulated lead acid batteries available.

Due to the above mentioned features we can confirm that NP batteries when used according to manufacturers recommendations are safe to use in a normal office, industrial or domestic environment without the necessity of providing a separate battery room or special ventilation.

In expansion of point A. above we can confirm that NP series batteries have been approved by the South Africa Bureau Standard No. 0108 for "use in hazardous locations" including underground mining locations, where the gas produced was 0.025 cc/Ah/cell/ho r and the rate of air change was 0.15 litre/Ah/cell/hour.

In expansion of point B. above we can confirm that NP series batteries have been classified as "non dangerous A67" by IATA regulations 24th edition (ie. they may be shipped un-restricted by air transport if packaging protects the terminals from short circuit).

D. "We confirm that Yuasa NP series batteries have been used safely and satisfactorily for many years world wide to power models and toys, and due to this experience are considered to be a most suitable battery for these applications".

DOCUMENT QAT02-M

V E N T I L A T I O N

Although Valve Regulated Lead Acid batteries are designed to generate gas far less than conventional open vented types and also use "gas recombination technology" to retain the generated gas within the battery, the system is not 100% efficient therefore these batteries are not designed for use in gas tight or sealed enclosures.

In most cases "Static Ventilation" is perfectly adequate to handle the small volumes emitted, however if absolute assurance is required the following recommendation can be used;

$$V = t \cdot s \cdot g \cdot i \cdot n \cdot (1-e) \cdot 0.001$$

V	=	Volume of ventilation required (Metres cubed/hour)
t	=	Dilution Factor (=26)
s	=	Safety Factor (=5)
n	=	Number of Cells
g	=	Theoretical volume of gas generated per hour overcharge at 25°C normal Atmospheric Pressure (0.46L/hour/cell).
i	=	Charge Current (A)
e	=	Gas Absorption Efficiency

NOTE:

1. "e" is approx. 99.5% when the float current is below 0.01c (assuming correct float voltage).

2. If under fault condition the float voltage limits are exceeded the float current will also rise and the absorption efficiency will drop.

3. For batteries on float voltage the minimum size of ventilation hole has been calculated as 0.065mm2 per Ampere-hour per cell assuming wall thickness of 5mm. Best position for ventilation holes is directly above the battery; for example:

   (a) 1 x NP24-12 requires 9.36mm2 area hole (ie diam=3.45mm)

   (b) 1 x NP7-6 requires hole minimum diameter 1.3mm.

4. For batteries on cyclic voltage, it can be assumed that the overcharge cyclic current is 10 times greater than the overcharge float current, indicating that hole size should be increased by a factor of ten (10).

DOCUMENT: QAT02-J

PRE-INSTALLATION BATTERY CHECKS

A battery's open circuit voltage (OCV) should always be checked before its installation into a standby system, whether it is a single battery security system or a high voltage battery group in a UPS.

Usually a healthy 12 volt lead acid battery can be expected to have an OCV of at least 12.6 volts (2.1 VPC), but this may be less due to self-discharge in storage. If the OCV is less than 12.6 volts but greater than 12.3 volts it is necessary to top charge the battery at about 14.5 volts according to manufacturers recommendations before installation.

If the measured OCV is less than 12.3 volts, this suggests that, whilst in a discharged state, the battery plates have developed an appreciable layer of sulphation. In this case the battery should not be installed until its capacity has been checked by separate discharge test after top charging.

It is also advisable to check the physical appearance of the battery for any damage that may have been caused by rough treatment since leaving the factory. All NP batteries leave the factory in a fully charged, fully inspected state, including satisfactory charge acceptance, capacity and completeness of case seal. The battery terminals are sealed into the case with a resin surround to prevent atmospheric oxygen entering the cell. This seal can be broken by rough treatment.

DOCUMENT: QAT02-T

YUASA STATEMENT ON SERVICE LIFE FOR QUOTE NO:

The batteries offered will give a service life of not less than five years for the specified duties at 25°C provided that:

1. No changes are effected in the criteria used for the selection of the batteries recommended.

2. Manufacturers recommendations are observed relevant to operating conditions, of temperature, float voltage, discharge cycling and ripple.

3. Recommended cut off voltages are applied to protect the batteries from deep discharge.

4. Regular maintenance checks are carried out with standard procedures to check operating conditions are within recommendations and that system connections have not deteriorated.

This statement is issued without prejudice to our normal Terms and Conditions of sale on condition that any suspect battery may be examined by the manufacturer to ascertain if defect of material or manufacture exists including substitution of individual blocks in the system if necessary in order to achieve the stated life.