

# Fluxes: The headache of choice?

BALVER ZINN makes the choice of the perfect flux easier!



REGI-Series: What flux for which application?

REGI-RED / BLUE / GREEN or GOLD



## Introduction

Wave soldering applications with or without nitrogen, selective soldering, dip tinning, cable assembly by hand or machine, manual soldering and many other processes have different requirements for the choice of soldering materials especially to fluxes. In addition, there are specific requirements from the application areas of the assemblies, such as automotive, industrial applications, consumer electronics, medical, Military and many more. Choosing the right flux can often be a challenge, and this article aims to provide a solution.

## Solvent Systems

Originally fluxes were provided with an alcohol as a solvent system, which could be for example Isopropyl alcohol (IPA), ethanol or other mixtures. Over time, and especially recently because of sustainability, more and more water-based or water-containing fluxes are finding their introduction into electronics manufacturing processes. Cobar, the inventor of partially water-based fluxes, has revolutionized "hybrid technology." These so-called "low-VOC" fluxes have become more and more a standard in electronics manufacturing.

## What might be the reason

The solvent in the flux has the function to dissolve the solids (active parts) so that these can be supplied to the surface of the substrates. After that, the solvents have no purpose anymore and should be evaporated completely during the pre-heat in the process.

Originally fluxes contained Rosins or Resins and therefore a solvent capable of dissolving these Rosins and /or resins was needed: alcohol!

The boiling point of alcohol is approximately 78.5°C, which allows the process to have relative low preheating temperatures.

Alcohol has a very low surface tension which improves spreading and capillary fill of the barrels.

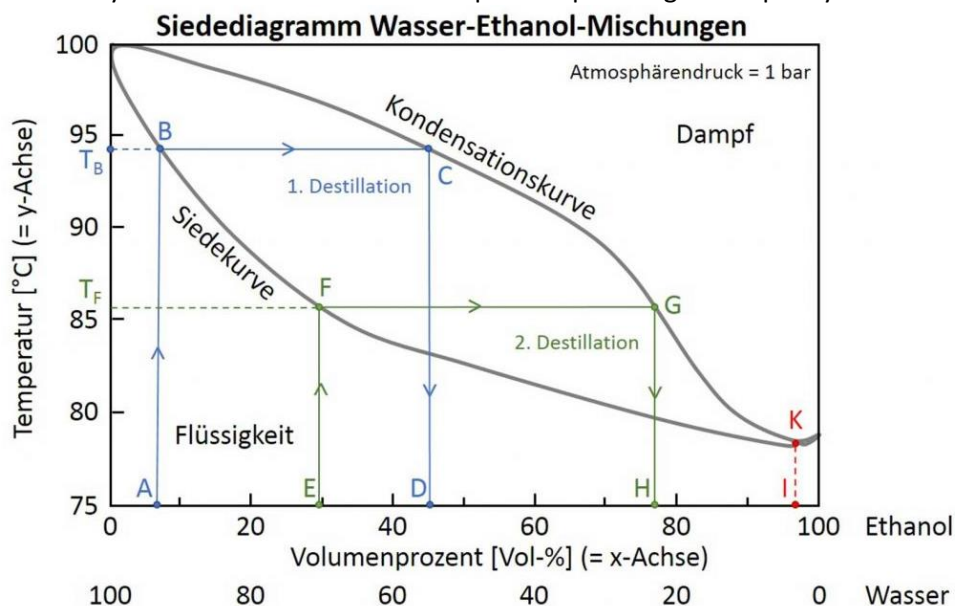


Fig. 1: Boiling diagram of water-ethanol mixtures

Source: <https://www.whiskyguide-deutschland.de/warum-einmal-nicht-ausreicht/>

With the introduction of No-clean technology the use of organic components in fluxes have increased. We no longer need to rely on alcohol as a solvent system to dissolve the Rosins and / or Resins, but deionized water can also be used to dissolve these organic compounds. Disadvantage of using full water-based fluxes is that the boiling point is 100°C so approx. 20°C higher as alcohol and therefore requires process adjustments like increased preheating temperatures and preheating times. Short preheating's cannot be used for water based (VOC-free) fluxes.

In that time Cobar wanted to introduce resin-based fluxes with a water content to meet automotive requirements:

This was the birth of so called low-VOC (partially water-based) fluxes.

Low-VOC fluxes have now established themselves across all applications in the market.

Another advantage of these Low-VOC fluxes is their lower boiling point, lower surface tension and reduced spreading (fig. 2) compared to VOC technology. The flux stays more to the area where it is applied leaving less visible residues.

This spreading characteristic makes the Lo-VOC fluxes extremely suitable for selective soldering processes.

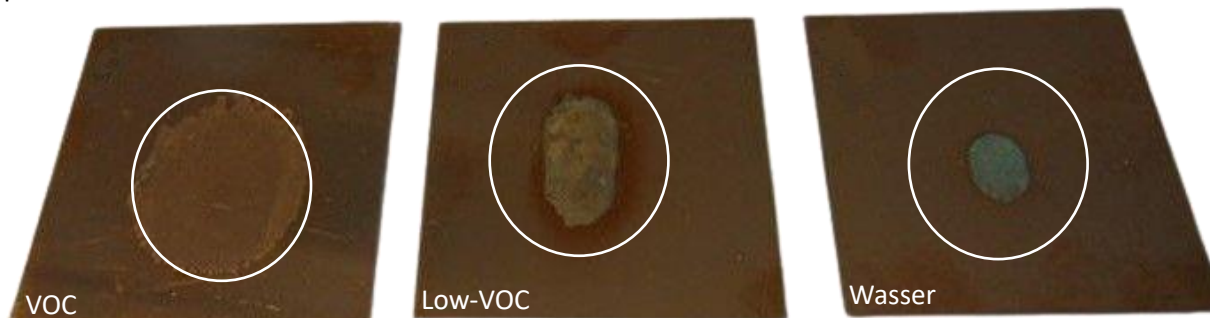


Fig. 2: Flux spread with different solvents

## Fluxes: the structure

Modern fluxes must be very versatile and should be applicable with all known pad finishings.

Whether used in processes with or without Nitrogen the flux should be suitable to comply with multiple processed products (2x reflow, wave soldering, selective soldering) and should still exhibit perfect solder results.

And still the fluxes are not allowed to have high activity. The residues must be safe and preferably invisible, ideally, they should be very easy to clean when the application requires this. Other applications like high reliability and Automotive expect the residues to encapsulate the residual activators by making a perfect polymerization.

Most users require cosmetical clean boards above optimum polymerized residues.

A lot of different applications and requirements.

For these reasons, modern fluxes are predominantly based on Organic and no longer contain high amounts of Rosins or Resins. At least most of the solids are organic.

This results in leaving very little, non-sticky residue on the assembly and as such visible clean boards.

## Fluxes: the choice

Dr. Regina Meinhardt, Head of Research & Development at Balver Zinn, played a key role in the development of Balver Zinn's latest flux technologies.

As an appreciation of her work in the field of new innovative product development Dr. Meinhardt is also present in the name of this latest REGI series (REGI<sub>na</sub>), a complete new innovative range of fluxes for all market needs and requirements.

## REGI-RED: The All-rounder!

Starting with REGI-RED, an alcohol-based flux initially developed for wave soldering but can also be used in other common processes.

REGI-RED, is classified as ORL0 and is extremely temperature-stable.

Like almost all fluxes in the REGI series, REGI-RED is particularly suitable for use on older, long stored PCBs that will be exposed to multiple soldering processes.

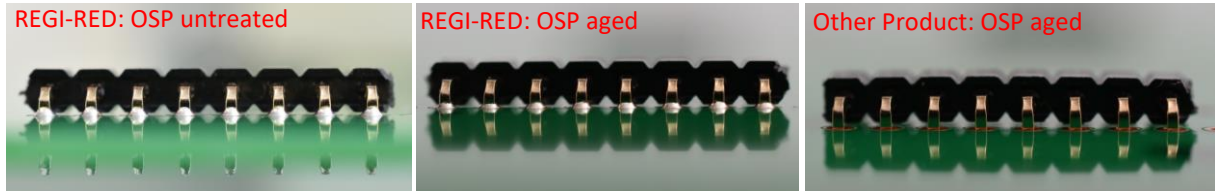


Abb. 3: REGI-RED on OSP fresh and aged (2 x Reflow) in comparison

Even at elevated preheating temperatures > 130°C on the PCB surface, REGI-RED shows excellent soldering properties and leaves almost no visible residues, even without the use of nitrogen.

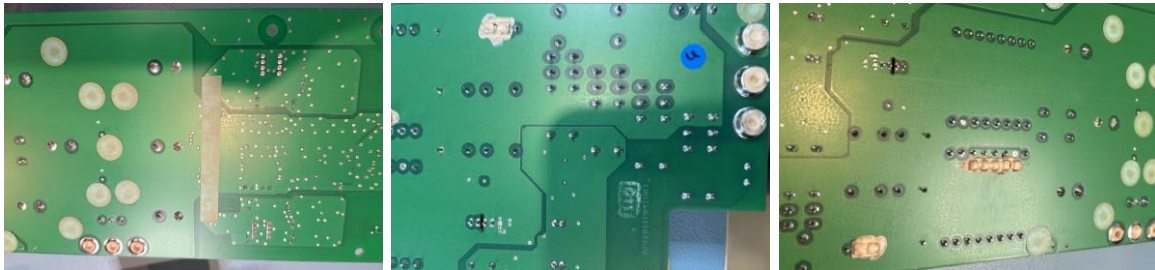


Abb. 4: REGI-RED visually no residues

## REGI-BLUE: The Sustainable!

Another extreme is represented by REGI-BLUE, water-based and also ORL0 classified, the REGI-BLUE also shows excellent soldering properties. REGI-BLUE is the safest water-based flux on the market, showing very high SIR values and absolutely no signs of corrosion even if it is water-based.

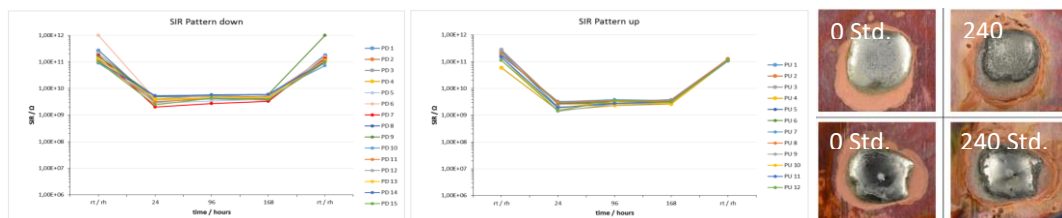


Abb. 5: REGI-BLUE offers high SIR values and no signs of corrosion

Especially when soldering with solder pallets, REGI-BLUE does not leave the typical residues on the contact surfaces with the PCB.



Abb. 6: REGI-BLUE gives optically clean boards with no visual residues

Water-based fluxes are less expensive than alcohol-based fluxes, are not classified as hazardous goods, are not subject to special storage conditions and the freight costs are lower.

As REGI-BLUE has demonstrated to be one of the safest water-based fluxes on the market, there is no reason to not use it in the automotive sector.

Water-based fluxes are more cost-effective than alcohol-based ones, are not classified as hazardous materials, are not subject to special storage conditions, and freight costs are correspondingly lower.

This comes at slightly increased energy costs, as the preheaters must be raised by approximately 20–30°C. Furthermore, the residues from water-based fluxes are hygroscopic and in humid environment could lead to corrosion issues. This has now been resolved with the new REGI-series as these fluxes have a corrosion inhibiting behaviour leading to NO corrosion risk.

This makes the new innovative REGI fluxes very suitable for certain applications (automotive), as before these were only applicable to a limited extent, or only after appropriate validation. Since REGI-BLUE is proven to be one of the safest, if not the safest water-based flux on the market, its use in the automotive sector would not be too challenging.

For these reasons, among others, Cobar developed and introduced low-VOC fluxes primarily to the automotive sector. Even after more than 25 years on the market and finding its application at many automotive companies, "old-school" fluxes such as 94-QMB (P), 396-BSG, and 95-RXZ-M remain indispensable in automotive applications. However, more modern, safer, and more reliable low-VOC fluxes are needed. REGI-GREEN is one of them.

For the highest safety there is the REGI-GOLD in this series of new innovative fluxes. In short there is for every application the perfect flux.

## REGI-GREEN: The Hybrid!

REGI-GREEN is based on REGI-RED, but contains 30% water, it is also classified as ORL0. The evaporation temperature of REGI-GREEN is slightly (3 - 4°C) higher than of VOC based flux, so the change can be made 1:1 without major process adjustment.

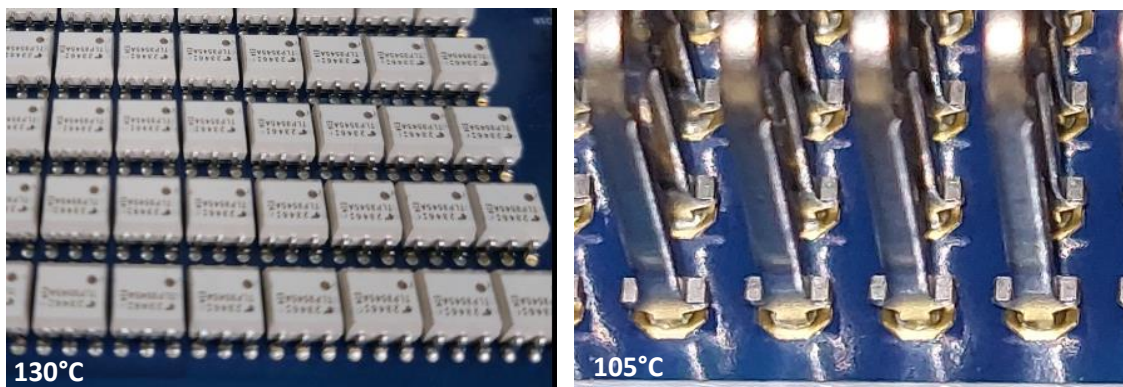


Fig. 7: REGI-GREEN on a very complex assembly and very short preheating (70 cm). Temperature reached: 130°C on the left, 105°C on the right on the top

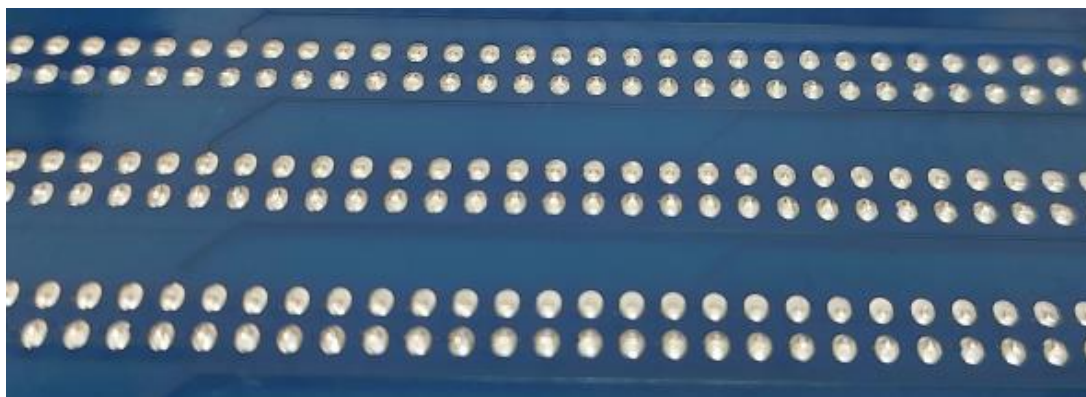


Fig. 8: REGI-GREEN shows almost hardly visible residues

## REGI-GOLD: The Reliable!

The latest addition to the REGI-series is REGI-GOLD, based on rosins and therefore classified as ROLO. REGI-GOLD is designed to improve polymerization and as such encapsulate any residual activators with the rosins and thus leaves the safest residues possible.

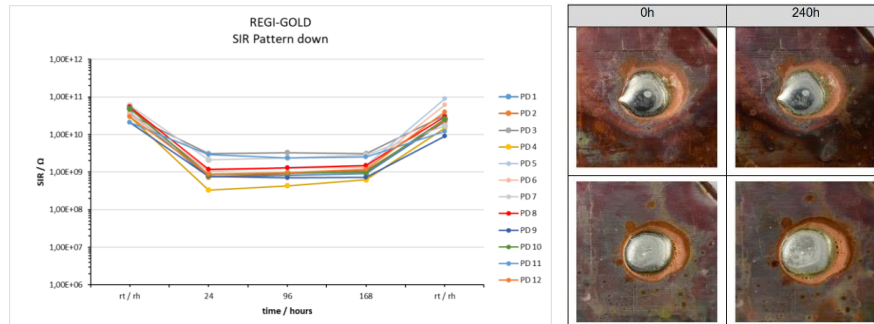


Fig. 9: REGI-GOLD very safe residues and high SIR values

## Summary

With the REGI series, we offer solutions for every requirement, if it's the "all-rounder" REGI-RED, the Rosin-based REGI-GOLD or the "sustainable" REGI-GREEN (30% water) and REGI-BLUE (100% water). All fluxes in the REGI series have been specially developed for pre-aged PCB surfaces. Especially OSP pad finishing can cause some wettability problems after multiple temperature processes (like 2 x reflow). REGI-RED and REGI-GREEN have been specially developed for this application.

Have we caught your attention? ..... Please don't hesitate Get in touch with us!

You can find more information here: [Website link](#)