

Certification of Translation Accuracy

Translation of **Technical Report** from **Spanish** to **English**

As an authorized representative of RushTranslate, a professional translation services agency, I hereby certify that the above-mentioned document has been translated by an experienced, qualified and competent professional translator, fluent in the above-mentioned language pair and that, in my best judgment, the translated text truly reflects the content, meaning, and style of the original text and constitutes in every respect a complete and accurate translation of the original document. This document has not been translated for a family member, friend, or business associate.

This is to certify the correctness of the translation only. I do not make any claims or guarantees about the authenticity or content of the original document. Further, RushTranslate assumes no liability for the way in which the translation is used by the customer or any third party, including end-users of the translation.

A copy of the translation is attached to this certification.



Mike Bortscheller
Authorized Representative
Order Date: March 11, 2024

RushTranslate
640 South Fourth Street
Suite 300
Louisville, KY 40202
United States



**TECHNICAL EVALUATION REPORT
ON THE IN SITU PRODUCTION OF SODIUM HYPOCHLORITE FOR WATER
DISINFECTION**

ANTECEDENT

On March 4, 2021, the Water Laboratory Directorate received Instruction Note No. 0425-2021 from INFOM Management, through which a technical evaluation of the CIGSA company proposal for the in situ production of sodium hypochlorite using the electrolysis technique, aimed at the disinfection of water for human consumption.

On the date described, the representative of the company was presented to the INFOM Laboratory with the equipment called "Aquachlor AC-100" shown in photograph 1 in the annex of this report, to carry out the installation, calibration and start-up of the equipment, to start the production of hypochlorite, and with the purpose that the analyst staff of the INFOM Water Laboratory could have in view the production procedure of sodium hypochlorite and subsequently monitor the result of the concentration of the product.

SCOPE AND LIMITATIONS

In accordance with the instruction note issued by the INFOM Management, the Water Laboratory is limited to evaluating the final product obtained in the demonstration carried out by the proposing company, so that the installation, calibration and chlorine production phase was carried out by the representative of the company, and it was up to the Water Laboratory to listen to the explanation, read and know the chemical reactions involved, observe the way in which the equipment was installed until the end of production, and finally, carry out the physicochemical analyzes to determine the hypochlorite ion concentration of the final product, with the aim of checking whether it conforms to the theoretical value proposed by the manufacturer's manuals, and to verify whether the product conforms to the treatment methods authorized by ministerial agreement 1148-09 of the Ministry of Public Health and Social Assistance called "Manual of Sanitary Standards that establish the processes and methods of purification of water for human consumption" specifically in article 4 Definitions, section "i" "Sodium hypochlorite", and Article 17 "Process of disinfection" ...application of chlorine or its derivatives".

[LOGO: GOVERNMENT OF
GUATEMALA
DR. ALEJANDRO GIAMMATTEI]

**DEVELOPMENT INSTITUTE
MUNICIPAL -INFOM-**

**Reference: oficio-Lab-Dir-171-21
Guatemala, MARCH 8, 2021
Page 2 of 3**

ACTIONS DONE

On the indicated date, the company representative installed the equipment and after the corresponding calibrations, began the production of sodium hypochlorite from the electrolysis of a solution of common salt (sodium chloride) in water, which serves as material. premium for its production.

The manual of the aforementioned equipment was in view, where the details of the theoretical chemical reactions that produce the hypochlorite ion (ClO^-) were observed from the dissociation of hypochlorous acid (HOCl) and Sodium Hypochlorite (NaOCl) that They are formed from the electrolytic reaction of Sodium Chloride (NaCl) in aqueous solution.

Likewise, it was observed that the company representative prepared the brine by dissolving 3.61 kilograms of commercial common salt in 105 liters of drinking water, and subsequently introduced the electrode into said brine and activated it for a period of 6 hours and 20 minutes, a voltage of 12 V and a current of 55 Amps, to complete the electrolysis reaction, according to the theory in the equipment manual.

After the reaction time, the production process was completed, with which the analyst staff from the INFOM Water Laboratory proceeded to capture samples of the final product, to analyze it and determine its concentration.

According to section "3", page 8 of the "Installation, Operation and Maintenance Manual" of the AQUACHLOR AC-100 "in situ" Sodium Hypochlorite Generator provided by the company and attached to the Management Instruction Note, the concentration of Expected chlorine for the final product should be at least 0.6% hypochlorite ion.

RESULTS

A first sample was collected on March 5 and a second on March 8, with the purpose of analytically determining the concentration of hypochlorite ion and seeing its stability within the first 4 days since it was produced.

It was determined that on the first day, the concentration was 0.671%, and on March 8, the concentration was 0.633%.

The analysis was carried out using the methodology established by Riaño, Néstor "Fundamentals of Analytical Chemistry", 2nd. 2007 Edition, ISBN: 978-958-8319-00-1

[LOGO: GOVERNMENT OF
GUATEMALA
DR. ALEJANDRO GIAMMATTEI]

**DEVELOPMENT INSTITUTE
MUNICIPAL -INFOM-**

**Reference: oficio-Lab-Dir-171-21
Guatemala, MARCH 8, 2021
Page 3 of 3**

The annex to this report details the table of data collected and data calculated to reach such determinations.

CONCLUSIONS

- 1) It was determined that the substance produced agrees with the specificity of the analytical methodology for sodium hypochlorite, so it can be considered that the equipment effectively produces sodium hypochlorite.
- 2) Therefore, it can be considered that the final product obtained using the proposed equipment complies with the treatment methods authorized by ministerial agreement 1148-09 of the Ministry of Public Health and Social Assistance called "Manual of

Health Standards that establish the processes and methods of purification of water for human consumption" specifically in article 4 Definitions, section "i" "Sodium hypochlorite", and Article 17 "Disinfection process" ...application of chlorine or its derivatives" .

- 3) It was determined that the hypochlorite ion concentrations obtained during the first 5 days after the product was manufactured meet the expected theoretical value, so the stability of the product can be considered acceptable at least during the first week of storage. Note that it is recommended to carry out longer-term studies to establish with certainty the durability of the concentration for storage for longer periods.

Hoping that the concepts expressed in this report are useful to you, and without further ado for the moment, I subscribe to you.

Sincerely,

**Jorge Mario Estrada Asturias
Chemical Engineer, collegiate 685
M. Sc. In Sanitary Engineering
DIRECTOR OF THE WATER LABORATORY
MUNICIPAL DEVELOPMENT INSTITUTE**

8a Street 1-66 Zone 9 Guatemala, C.A.
PBX: 2317-1991

www.infom.gob.gt

Follow us on: [FACEBOOK] [X] [INSTAGRAM] [YOUTUBE]

[LOGO: GOVERNMENT OF
GUATEMALA
DR. ALEJANDRO GIAMMATTEI]

**DEVELOPMENT INSTITUTE
MUNICIPAL -INFOM-**

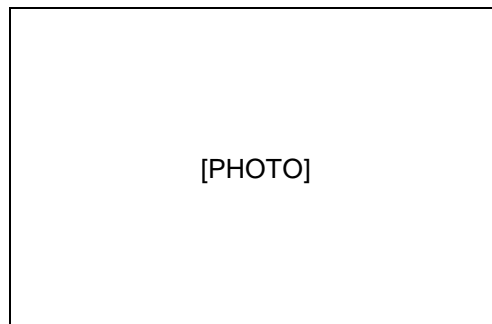
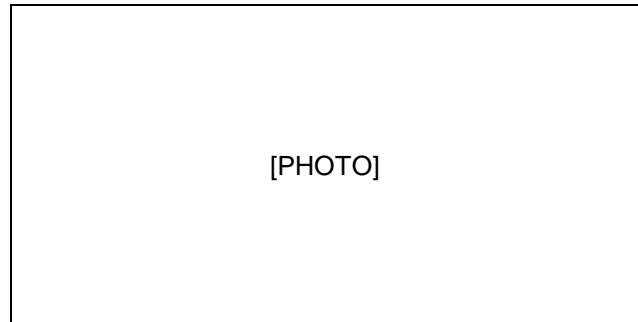
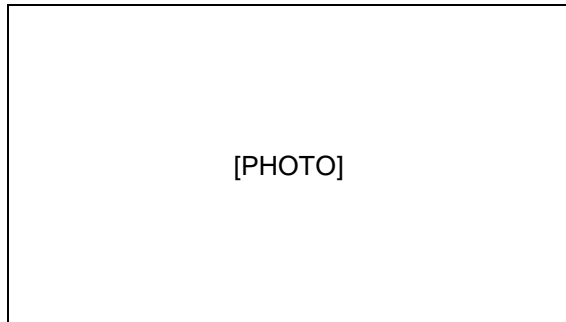
Reference: **oficio-Lab-Dir-171-21**
Guatemala, **MARCH 8, 2021**
Page 1 of 2

**ANNEXES TO THE TECHNICAL EVALUATION REPORT
LAB-DIR- 173 -2021**

Calculated data table

Thiosulfate Concentration (N)	Consumption (mL)	Mmol NaOCl-	Grams NaOCl	Dilution	Aliquot (mL)	g/mL	Weight/volume percentage of NaOCl (% w/v)
Date: march 5, 2021							
0.025	1.8	0.02	0.00168	100	25	0.00671	0.671
Date: march 8, 2021							
0.025	1.7	0.02	0.00158	100	25	0.00633	0.633

DIFFERENT PHOTOGRAPHS OF THE PROCESS



[LOGO: GOVERNMENT OF
GUATEMALA
DR. ALEJANDRO GIAMMATTEI]

**DEVELOPMENT INSTITUTE
MUNICIPAL -INFOM-**

**Reference: oficio-Lab-Dir-171-21
Guatemala, MARCH 8, 2021
Page 2 of 2**

