



CHEMICAL DOSING



“Dual-channel Flexim clamp-on flowmeters with alarm outputs provided us with a cost-effective solution in replacing existing flowmeters & flow switches.”



*Emad Al Koot,
Superintendent – Instrument
Maintenance Department, Ministry of
Electricity & Water & Renewable Energy,
Sabija Power Station.*



Measuring Task

Non-invasive flow measurement of chemical dosing at the distillation plant of MEW’s Sabija Power and Water Distillation Station

Sabija Power and Water Distillation Station is the largest power and water provider in Kuwait. Its distillation plant consists of eight distillers with an installed capacity of 12.5 MIGPD each totalling 100 MIGPD. All distillation units use the multi-stage flash evaporation method (MSF).

The MSF process is based on heating salt water to temperatures between 190 °F and 250 °F in brine heaters. The water is then pumped to a series of consecutive low-pressure chambers, which are under vacuum. The water flashes as it enters each chamber and produces water vapor upon entering the temperature of each chamber. The saltwater temperature reduces as it passes through the different chambers and, therefore, the vacuum pressure keeps reducing to ensure flash evaporation in all the chambers. The rising water vapor from the chambers is condensed on the outer surface of the feed water tube bundle producing desalinated water. This also results in preheating the feed water before entering the brine heater which will reduce the energy required for heating.

Untreated seawater contains various kinds of minerals, dissolved gases, and foreign substances. Some of them cause extensive damage and corrosion throughout the distillation process, leading to an adverse performance and reduced process plant life cycle.

As a result, chemicals are added to the seawater to be treated. Each of the distillation units has six dosing lines through which a descaler, sodium sulphate and anti-foaming agent are added to the raw water. The injection of chemicals and their dosing, which should be as correct as possible, is of enormous importance for trouble-free plant operation. This is why it must be monitored by measurement.

For this purpose, variable area flowmeters and flapper type flow switches were installed in the plant. These simple measuring devices were subject to considerable wear and tear and caused an enormous amount of maintenance. Moreover, they have only a very limited measuring range and are difficult to read. Therefore, the plant technicians were looking for a more reliable measuring technology with which they could precisely monitor the dosing of the expensive chemicals. Another requirement was the integration of the flowmeters into the plant's DCS.



El Sabiya Power and Water Distillation Station is the largest power and water provider in Kuwait.
© MEW

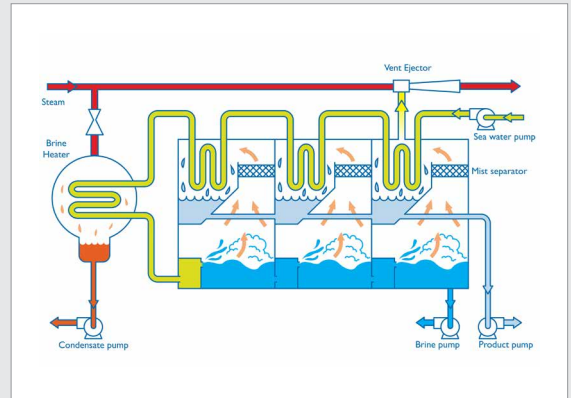


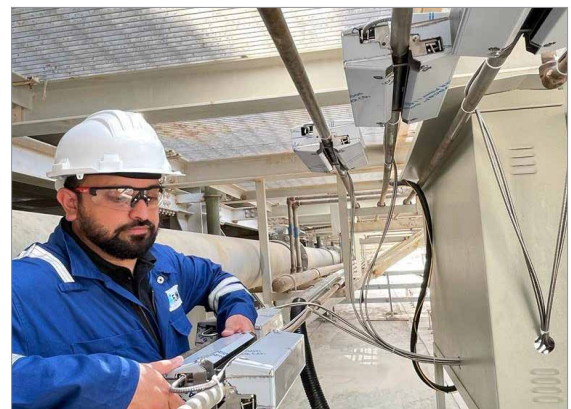
Illustration of the desalination process using Multi-Stage Flashing (MSF)
© The Cooperation Council for the Arab States of the Gulf (GCC) General Secretariat



Solution

It goes without saying that non-invasive flow measurement with Flexim's clamp-on ultrasonic technology is the far superior solution for this kind of application. As the transducers are simply mounted onto the outside of the pipe, they are not subject to any wear and tear by the medium flowing inside. Installation does not require any opening of the pipe and is done during ongoing operation. In contrast to wetted mechanical measurements, the acoustic method covers an extremely large measuring range and is capable of recording even the lowest flow rates.

As a result, the plant engineers decided to replace the outdated wetted measurement technology with FLUXUS® ultrasonic measurement systems from Flexim. In total, 48 injection lines had to be equipped with clamp-on ultrasonic flowmeters. The choice fell on FLUXUS® F721 stationary transmitters in dual-channel design. Thanks to the two measuring channels, via which the flow can be measured simultaneously at two independent measuring points, 24 transmitters are sufficient for the 48 measuring points. The installation of the measurement systems and their commissioning was carried out by experienced flow experts from the FLEXIM Middle East team. Thanks to the simple integration into the DCS, the chemical dosing can be automated and monitored at any time by the operating personnel in the control centre.



Saad Altaf, sales engineer at FLEXIM Middle East, setting up the flow measurement points.



The Variofix C transducer mounting devices provide the transducers mounted in them with a permanently firm hold and protection.

The users are more than satisfied with the solution adopted. Emad Al Koot, superintendent of the power plant's instrumentation and maintenance department, sums up his experience with Flexim as follows:

“Chemical dosing has always been a crucial function in distillation operations, to ensure optimal plant operations. Accurate flow measurement is necessary for monitoring & optimizing the dosage of chemicals, to achieve improved quality output & cost-effective operations.

After a few specific trial runs that were carried out under different site conditions, Flexim's non-invasive ultrasonic technology was identified to fulfill our plant requirements. It was an optimal solution to replace the existing variable area type inline flowmeters, which were based on outdated technology and produced unreliable results. It was also evident that flow switches suffer wear and tear, thereby causing downtimes, due to frequent failures and inaccurate measurements, when available.

Dual-channel Flexim clamp-on flowmeters with alarm outputs provided us with a cost-effective solution in replacing existing flowmeters and flow switches. Through the course of this experience, the product solutions, after-sales and service support offered by Flexim and their local channel partner in Kuwait was commendable.

We look forward to working together with Flexim, whenever there is a need for expertise in flow measurement. We now have first-hand experience of Flexim's knowledge and technical expertise and we are confident in Flexim's ability to handle any flow challenges.”



Dual-channel versions of the FLUXUS® F721 stationary ultrasonic systems are used as transmitters.



Advantages

- Reliable, accurate and robust non-invasive flow measurement
- Easy installation and replacement of existing flowmeters without cutting into the pipe or interrupting the process
- No risk of leakage of dangerous media, no wear and tear
- Cost-efficient solution through the use of dual-channel devices
- No expensive special materials required
- Simple integration into the DCS
- Effective optimization of plant operation and significant cost reductions through adjusted dosing of chemical additions and elimination of maintenance effort
- Excellent cooperation with the FLEXIM Middle East team and the local sales partner

It is estimated that the overall savings made by MEW while opting for Flexim would be around \$50K through the installation and commissioning process. There would also be a further year-on-year saving of at least \$50K in optimization of chemicals used for dosage and the reduced manpower required for the overall maintenance of these units.

Measuring points and instrumentation

Chemical dosing system is available at all eight distillation units.
Each system has the following flow parameters for chemical dosing:

Dosing System	Liquid Concentration [%]	Flow Range [kg/h]	High Flow Alarm [kg/h]	Low Flow Alarm [kg/h]
Anti-Scale	Var. 4 ~ 7%	65 – 700	430	260
Sodium Sulphite	5%	65 – 700	410	247
Anti-Foam	1%	0 – 170	116	64
Pipelines:	1", stainless steel			
Measuring systems:	24 stationary clamp-on ultrasonic flowmeters FLUXUS® F721 in dual-channel design with 48 pairs of clamp-on ultrasonic transducers type FSQ, mounted in transducer mounting devices VARIOFIX C			

Customer

Ministry of Electricity & Water & Renewable Energy, Sabiya Power Station and Water Distillation, Shumaymah, Kuwait

Ministry of Electricity, Water and Renewable Energy (MEW) is a government-owned state agency in the State of Kuwait, offering energy and water solutions to the population of Kuwait, while continuously increasing infrastructure & generating revenue for the overall improvement of the country.

The Ministry's Power and Water Distillation Stations sector has six stations distributed throughout the State of Kuwait. Established in 1998 and located in the bay area in the north of the State of Kuwait, Sabiya Power and Water Distillation Station is the newest of them. With an installed electrical capacity of 7046.7 MW and an installed distillation capacity of 100 MIGPD, it is the largest power and water provider in Kuwait.



The Emerson logo is a trademark and service mark of Emerson Electric Co.
Brand logotype are registered trademarks of one of the Emerson family of companies.
All other marks are the property of their respective owners.
© 2023 Emerson Electric Co.
All rights reserved.

For more information, visit:
[Emerson.com/Flexim](https://www.emerson.com/Flexim)

AR-202325-MEW-US

