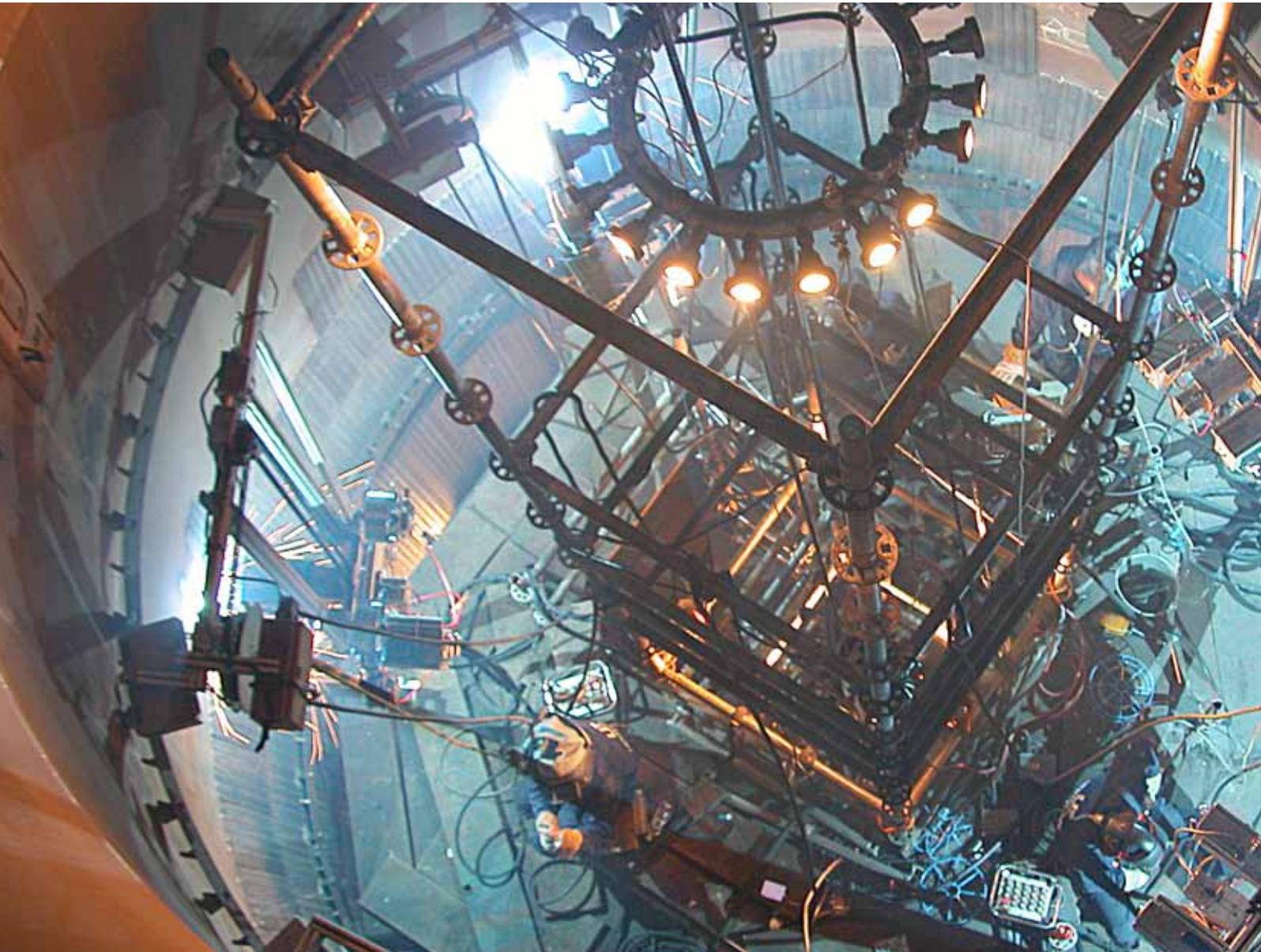


Corrosion resistant
weld overlay

The Uddcomb Method

- The ultimate solution for corroded digesters



We have spent more than 25 years reconditioning digesters

1987 we finalized the first weld overlay project at the Munksjö Billingsfors mill in Sweden. We carried out our largest digester weld overlay assignment to date at Södra Cell's Värö Pulp Mill between 1988-90. We reconditioned nine batch digesters, with a combined surface area of 1,463 m². Since then, we have welded an additional 13,500 m²; the area is a size of three football pitches.



We save time and resources for the industry

Batch and continuous digesters are pressure vessels that are traditionally made of carbon steel. Cooking process modifications in order to increase or change the pulp production have increased corrosion and erosion problems in digesters. After years of operation the corrosion allowance is gone. If corrosion is not stopped, the digester will eventually have to be taken out of service.

What is the Uddcomb Method?

AREVA NP Uddcomb AB has developed a superior method of reconditioning digesters and other pressure vessels. The stainless layer is metallurgical bonded with the base material. A three-millimetre stainless-steel layer is overlay welded on the corroded inner surfaces of the digester. The welding is done onsite using specially designed Gas Metal Arc Welding machines. Digesters restored with the Uddcomb method shows no sign of corrosion or loss of thickness.

There are a number of advantages with the Uddcomb Method

After weld overlay with the Uddcomb Method the corrosion resistance of the overlay welded surface will be similar to a new digester built in duplex stainless steel.

The weld overlay is homogeneous with the base material. There is no risk of crack formation due to different heat expansion properties in the weld overlay and the base material.

Consequently, there is no risk of process fluids leaking between the weld overlay and the base material.

We have executed projects worldwide:

- Brazil
- Finland
- France
- Canada
- New Zealand
- Spain
- South Africa
- Thailand
- Germany
- Austria
- Japan
- Sweden

The Uddcomb Method

- restores and improves



More flexible...

Using the Uddcomb Method to recondition a pressure vessel has a number of advantages:

- Weld overlay with the Uddcomb Method gives a corrosion protected surface similar to a new digester built in duplex stainless steel.
- Each equipment use two welding torches. With numerous equipments working simultaneously, down-time of the vessel is minimised.
- Hydro pressure testing is normally not required
- All equipment is taken into the pressure vessel via existing access man-hole hatches.
- Impact on the surrounding production environment is minimized.
- The stainless-steel overlay has excellent resistance and durability against erosion.

- Post weld heat treatment is not required.
- Removal of insulation is not required.
- At mills with batch digesters, it is possible to stop one digester at a time while the others can remain in service, which gives minimal down-time costs.

Is the digester an integrated part of the load bearing structure or is it placed inside a building? With weld overlay instead of replacement, reconstruction and rebuilding of the complete digester building can be avoided as well as investments in a new digester.

...faster...

The Uddcomb Method is the fastest way to recondition a pressure-vessel. A standard weld overlay of a continuous digester with a 300m² surface area can take us from six to eight days to complete.



We recondition **faster and with shorter shut-down periods**

The Uddcomb Method is the fastest method for reconditioning pressure vessels. It has been specially developed to suit the pulp industry's tight shut-down periods.

The high production rates can be explained by our specially designed equipment in combination with the welding procedure.

Each welding equipment are equipped with double welding heads working in parallel. Dual welding torches allow us to complete many projects in half the time.

There are other advantages with the Uddcomb Method besides saving time. High quality and long service life are just as important.

...and more durable

The Uddcomb Method has shown itself to be superior in terms of service life and quality in comparison to other alternatives. With the Uddcomb Method, the stainless-steel layer becomes homogeneous – this gives the digester increased wall thickness and an unbeatable protection against corrosion.

Uddcomb Method weld overlay eliminates the risk of the base material being exposed to corrosive process media in the overlaid area. The overlaid area is maintenance-free. No further repairs or upgrades will be required after weld overlay with the Uddcomb Method.

The Uddcomb Method

- for a sustainable industrial society



Testimonials about Uddcomb



“The result exceeded our expectations”

- **SVEN STRAND,**
MUNKSJÖ, BILLINGSFORS, SE

We carried out the first reconditioning in the middle of the 1980s. Since then, we've reconditioned more than 300 m².



“The Uddcomb method meant a long term solution to our corrosion problems”

- **WARRICK MOORE,**
CARTER HOLT HARVEY
TASMAN MILL, NZ



Typical corrosion in a carbon steel continuous digester.

The Uddcomb Method turns old into new

No-one can say for sure how long a pressure vessel upgraded with the Uddcomb Method in combination with filler metal AWS 312 will last. All indications, testimonials and projects suggest that our customers can look forward to several decades of maintenance-free service life.

Quality is assured through meticulous preparations and through qualification of welding procedures in our accredited welding and materials laboratory.

The Uddcomb Method – the resource-saving way to develop a production facility

The awareness of how limited our resources are has led to a new approach to technology.

How can we conserve, improve and save?

With new technology, new ideas and expertise, we are developing today's industries into the production facilities of tomorrow. We see the start when others only see the end.

Our concept involves contractor and consultant initiatives, based on our material, welding and engineering expertise, to increase performance, service life and accessibility in our customers' installations.

In 1995 we chose weld overlay as the preferred method to extend the life of the carbon steel cooking zone sections of its 2 digesters.

Maintenance issues with the overlaid area have been very minor over the 15 years of service since overlay. There has been no indication of any degradation of the overlay since it was applied.

“Areva NP Uddcomb – professional and reliable”

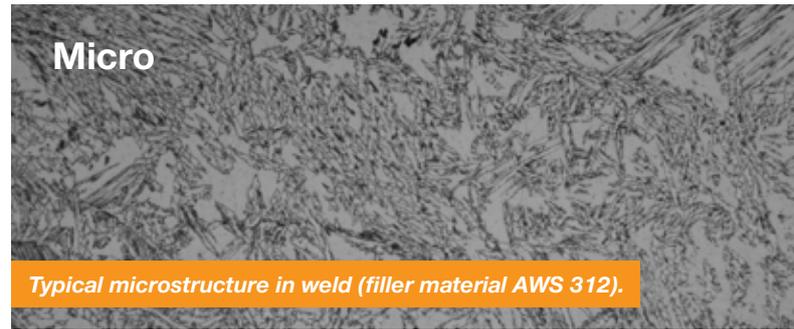
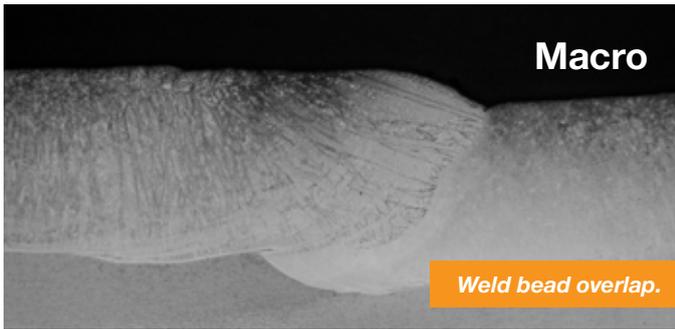
**- MARCEL WARNIER,
SITECH SERVICES, NL**

Areva NP Uddcomb successfully covered some wall areas in two Carbon Steel process columns with SS304 overlay welding. The job was carried out for Sitech Services during a very tight turn around of the DSM Agro Ammonia plant at Geleen, Netherlands.



Technical Data:

The Uddcomb Method



- Filler material: Alloy 29 9 (29 9: EN ISO 14343 ; SFA5.9 AWS 312) (29% Cr, 9 % Ni) for pulp sulfate process
- Final chemical analysis after overlay welding: ~24% Cr
- Weld overlay thickness: ~3 mm
- Weld overlay productivity: Up to 5,5 m²/24 hour/welding equipment. For extensive projects we use 10-20 welding equipments simultaneously.
- Most common base material thickness: 10-70 mm
- Welding documentation qualified in accordance with EN ISO or ASME IX;
 - Welding Procedure Specifications (WPS)
 - Welder Performance Qualifications (WPQ) and Welding Operator Performance Qualifications (WOPQ)
 - Welding Procedure Qualification Record (WPQR) and/or Procedure Qualification Records (PQR)

In addition we continuously develop welding procedures for specific national pressure vessel codes if required.

- Welding direction: Vertical down (The Uddcomb Method) or horizontal.
- Ferrite content: 25-50%
- Quality control after overlay welding: 100% dye penetrant testing of the surface
- Common areas for overlay welding: Cylindrical shells, behind and between the screens, top domes, bottom cones.
- Most common base materials: Carbon steel, e.g. SA516 Gr60, SS1430, H11.
- Pre heat requirements: All WPS are qualified without preheating, but preheating can be applied to fulfill national additional requirements.

Post weld heat treatment requirements: All WPS are qualified without PWHT which is not suitable to perform on any vessel after refurbishment.

For specific requirements, welding procedures can be developed in our own laboratory as part of our delivery.

Typical projects:

Vary from 20m² - 420m² in continuous digesters that has been executed during one outage.

For batch digesters that normally suffer from an aggressive corrosive/erosive environment a normal scope of work could be:

- Overlay welding of the complete digester including bottom cone, cylindrical shell and top dome. When the first digester is completed production can be started.
- Another example would be to overlay behind the screens.

AREVA NP Uddcomb's:

- **Quality System** is certified in accordance with EN ISO 9001:2000.
- **Environment Management System** is certified in accordance with EN ISO 14001:2004.
- **Occupational Health & Safety** is certified in accordance with the frame work of OHSAS 18001-2007.
- **Welding work** is certified in accordance with SS-EN ISO 3834-2:2005.
- **Laboratory** is approved as accredited testing laboratory by SWEDAC. The accreditation includes the requisite mechanical and metallographic testing required according to EN ISO 15614 and EN 287, as well as for the assessment of obtained testing result. The accreditation meets the requirements in EN ISO 17025:2005, STAFS 2007:7, STAFS 2007:9 and ISO/IEC Guide 2.



Typical corrosion in a carbon steel continuous digester.

AREVA NP Uddcomb AB is part of AREVA NP, the world's leading operator in carbon dioxide-free energy production. Its operations are organised in two business areas: one specialises in the nuclear power industry and one in the process industry.

Having AREVA's experience and strength behind us has increased our resources and areas of expertise. This has advanced the combination of know-how and hands-on skills that has always characterised the company another step forward. We work on everything from small pilot studies and engineering assignments to major turnkey projects with functional responsibility. No assignment is too large, complicated or too small.

www.aveva.se/uddcomb

AREVA NP UDDCOMB

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