Effective . Affordable . Sustainable

AQUA - EDF

ELECTRO DEFLUORIDATION PLANT

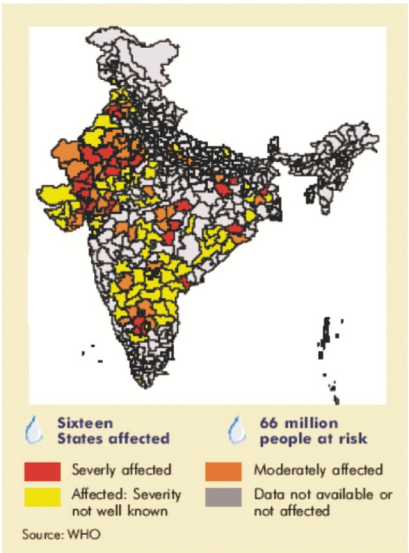
Sustainable Solution For Fluoride Removal

FLUORIDE PROBLEM IN INDIA

In India, the states of Andhra Pradesh, Bihar, Chattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal are affected by fluoride contamination in water. This involves about 9000 villages affecting millions of people.

The map shown here depicts the states in India having excessive fluoride content in ground water. It must be noted that the problem of excess fluoride in drinking water is of recent origin in most parts.

Digging up of shallow aquifers for irrigation has resulted in declining levels of ground water. As a result, deeper aquifers are used, and the water in these aquifers contains a higher level of fluoride.



EFFECT OF FLUORIDE IN WATER (WHO, 2004)

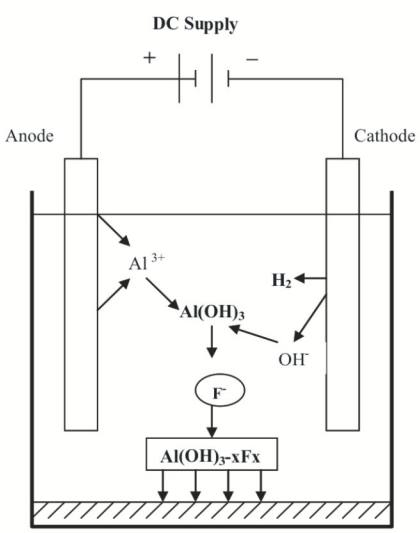
Fluoride Concentration (mg/l)	Health Effect
< 0.5	Dental Caries
0.5 – 1.5	Promotes dental health
1.5 – 4	Dental Fluorosis
> 4	Dental & Skeletal fluorosis

EDF PROCESS

ELECTROLYTIC DE-FLUORIDATION (EDF) a promising process of removing fluoride from water by electro-coagulation, which is an electrochemical technique, in which a variety of unwanted dissolved particles and suspended matter including fluoride can be effectively removed from an aqueous solution by electrolysis. Through the process of electrolysis, coagulating agents such as metal hydroxides are produced.

The aluminum species act as a coagulant by combining with the pollutants to form large size flocs and then can be removed by settling and flotation, making Electrolytic De-Fluoridation an efficient and better alternative to conventional coagulation.

In the EDF process, when aluminium electrodes are used, the aluminium dissolves at the anode and hydrogen gas is released at the cathode. During the dissolution of Al at the anodes various aqueous aluminium species are produced, which depend on the solution chemistry. The aluminium species act as a coagulant by combining with the pollutants to form large size flocs. Interactions occurring within an electrolytic defluoridation reactor are shown in the adjacent figure.



REACTIONS IN EDF

The electrolytic dissolution of anodes of EDF electrolyser by oxidation in water produces aqueous Al3+ species and the electrode reactions are outlined below:

Anodes : $Al(s) \rightarrow Al^{3+} + 3e^-$ (1)

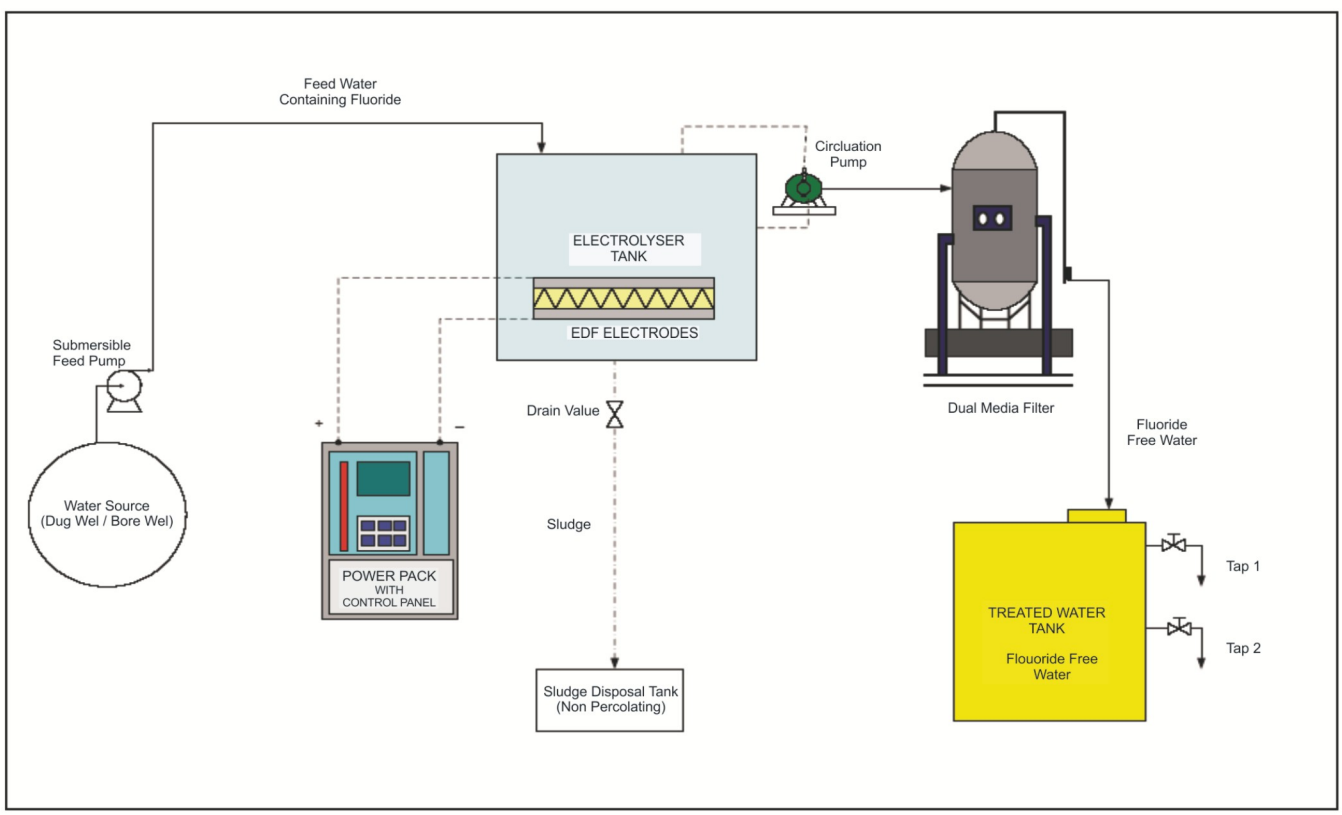
Cathodes : $2H_2O + 2e^- \rightarrow H_2(g) + 2OH^-$ (2)

The H_2 bubbles float and hence drive the flotation process. The Al^{3+} ions further react as shown to form a solid $Al(OH)_3$ precipitate:

$Al^{3+} + 3H_2O \rightarrow Al(OH)_3(s) + 3\dot{H}$ (3)

The strong presence of the hydroxy-aluminium thus generated maximizes the formation of aluminium fluoride hydroxide complexes [Al(OH)3-xFx] which is the main reason for defluoridation by electrolysis.

EDF SCHEMATIC



EDF ADVANTAGES

High Efficiency > 99%
Less Time Required for F Reduction
Cost Effective & Ease of Operation
No need of Regeneration
Cleaner than chemical coagulation
Disinfects water & reduces nitrates

SOLAR - EDF

Rite Water Solutions (I) Pvt. Ltd. Offers a more sustainable and affordable solution for removal of Fluorides. This technology involves the operation of EDF plant on solar energy. Solar cells convert the Solar energy into electricity and this is stored as renewable source of energy. This makes the technology more Eco Friendly.

EDF PLANTS INSTALLED IN FLUORIDE AFFECTED VILLAGES

EDF Vs CONVENTIONAL METHODS

Parameters	Chemical Precipitation	Activated Alumina Adsorption	R.O.	EDF
Efficiency	Lowest	low	Very High	Very High (Almost 100%)
Treatment cost / M^3	10-12	10-14	60	6-8
Treatment Time	2-4 Hrs	Very Slow Flow	Continuous	30 mins
Water Recovery	High	High	65%	Very High
Regeneration/ Maintenance	Not Required	Regeneration + Backwash	Required	Not Required
Man Power	Requires Manpower	Requires Manpower	Skilled Manpower	Negligible Manpower
Sludge	Maximum	High	High	Lowest

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