

## **Environmental Remediation Efforts in Northern California, U.S.A.**

**Glenn S. Kozawa<sup>1</sup>, Alvin Bonifacio<sup>2</sup>, Frank Bonifacio<sup>2</sup>, Sean Bonifacio<sup>2</sup> and Kurt Rasmussen**

*EM Technologies Inc., Tuscon, Arizona, USA<sup>1</sup>*  
*Frank Septic Service Inc.<sup>2</sup>*

---

**Abstract :** *In Pacific Coastal States, especially in State of California, there is a subtle migration of families to suburbs as there is an influx of emigrants to the metropolitan areas. In this movement of people, population of small towns and cities are increasing. Few small towns are preparing for the increase. This increase helps the tax base but it places overloading problems on the sewage treatment plant. Many are overloaded and needs new facility to deal with the increasing waste. Due to stringent environmental laws in California, it is a very difficult proposition to expand a current site or build a new site. However, EM technology can alleviate overloading of waste without outlay of huge expenses to improve the present treatment sites. On the other hand, many other communities depend upon household septic tanks to alleviate pressure on centralized treatment facility. However, this too becomes a problem for the sewage treatment center. Septic tanks are pumped once in three to five years to maintain them. This septage is delivered again to the sewage treatment facility. Again, this contributes to the overloading problem. The tipping fees that the septic service vendors pay are huge and their operations become very expensive. In United States, a quarter of 109 million housing units has septic tanks. Of 25,635,000 septic tanks, 24,115,000 units are year around occupancy and 1,521,000 are seasonal occupancy. Then, in the year around occupancy, 22,296,000 are “occupied” and 1,819,000 are “vacant”. Furthermore, 85% (“occupied”) are owned and 15% are rented. In the central cities, there are 584,000 units; in outside major suburban area (rural), there are 11,364,000 units; and in the suburbs, there are 12,167,000 units. Just imagine the number of breakdowns per year. However, EM has begun to resolve this issue for one community. EM can remediate a septage (domestic wastewater and sewage) in three to four days into so call “dirty water.” Upon official inquiry to State of California Water Quality Board, EM is not a regulated product and treated septage is allowed to go on to the field as irrigation water (for agricultural purpose). We have conducted replicated field test to determine remediation of septage in three to four days. In addition, EM can eliminate the breakdowns of septic systems. Just imagine a functional septic system with a clear leachate pipes and fields where soil matrix are improved over period of months and years.*

---

**Introduction** Through the efforts of our contact in Northern California, we began establishing a close relationship with FRANK’S Septic Service, Inc. (a.k.a. FRANK’S) in the City of Vacaville, 60 miles northeast of San Francisco on I-80. FRANK’S has been serving the Solano, Yolo, and the surrounding counties for fifty years. The septage service business began with the father, Mr. Frank Bonifacio, and now transferred to his son, Mr. Alvin Bonifacio, who is now the President of the company. Currently, his son, Frank’s grandson, is groomed for the head of the family company. Their business deals with installation of septic tanks and leachate pipes; servicing septic tanks; inspection; and construction of customized septic systems. Their daily routine revolves around the above business. However, servicing septic tanks is quite an expensive affair for the company. With few thousand clients around the counties, they extract septic tanks once so often to keep the utility of the system intact. The tank volume differs from 1,200 to 2,200-gallon tanks. Once the extraction is completed it is taken to their 30,000-gallon holding tank and sedimented before transferred to City of Vacaville or similar sewage treatment site(s). The tipping fee is very expensive. It is approximately \$6,000 thru \$8,000 per month. What stimulated the interest on the part of FRANK’S was the economy of operations using EM. They found a state certified laboratory and conducted replicated tests. The test proved that EM remediated the septage in three to four days. This means that the septage is in the range of Biochemical Oxygen Demand, Total Suspended Solids and Ammonia-Nitrogen to enter environment as a “dirty water.”

Due to treatment of septage on site, the City classified FRANK’S as **industrial wastewater treatment center**. This requires changes in permit and regulation. They changed their status in timely manner, and they are in full operational status again.

Now, they have constructed 4-million gallon capacity pond and a wetland to deal with the expanded dirty water coming out of their facility. The State Environmental Protection Agency (EPA), a.k.a., California Water Quality Board, has given “all clear” signal for discharge of septage for agricultural irrigation purpose, and now FRANK’S is waiting for the permit from Solano County Environmental Office. This final permit will allow FRANK’S to drain the treated septage water and mix it with Solano Irrigation District Water into the pond.

**Materials and Methods** For every 1,000 gallons of septage, one gallon of EM was applied. For this test, pure stock solution of EM Wastewater Treatment was used. The 30,000 gallon tank was filled with 27,000 gallons of fresh septage. To this, 27 gallons of EM were applied. The first round of tests missed the base line data, however. Then, the second round of tests was done (with base line data) to determine how quickly EM remediates the septage. For this test 3000 gallons of septage was used with 3 gallons of EM Waste Treatment. For these tests, FRANK’S used pure EM. However, for their daily operations, Extended EM (1:1:10) is used regularly. The City of

Vacaville Sewage Treatment Facility monitors the “industrial treated septage”.

## Results

The tests commenced on August 05, 1998 a few days after the treatment of 27000 gallons. Figure I shows the changes recorded in the first round of tests. The BOD dropped from 370 ppm to 160 ppm in one week. Although there was a slight increase to 173 ppm during the next testing date (June 11), the level gradually decreased thereafter to reach 39 ppm in 2 months. The TSS likewise dropped from 868 ppm to 84 ppm in one week. It too followed a similar trend as for BOD, increasing the level to 356 ppm in the second week and declining thereafter to reach 62 ppm by August. Ammonia N too decreased from 183 ppm to 90 ppm in one week and subsequently decreased to 67 ppm by August. Unfortunately for the first round of tests the baseline data was not taken.

The results of the second round of tests conducted to determine the baseline data and the length of time needed to remediate the septage to an acceptable level of discharge as “dirty water” are presented in Table 1. The results show that there is a definite remediation in progress.

**Table 1. The Concentration of BOD, TSS and TKN of Three Septage Trucks and the Reduced Levels 2 and 4 days after EM Treatment.**

|              | Date          | BOD  | TSS    | TKN  |
|--------------|---------------|------|--------|------|
| Truck # 1    | Dec. 03-1998  | 0    | 120000 | 1100 |
| Truck # 2    | - do -        | 0    | 210000 | 2000 |
| Truck # 3    | - do -        | 3400 | 25000  | 210  |
| Mixed Sample | Dec. 05, 1998 | 280  | 266    | 100  |
| Mixed Sample | Dec. 07, 1998 | 200  | 280    | 110  |

The results amazed the City of Vacaville Sewage Treatment Facility Senior Laboratory Technician. Thus far, the City has given excellent grade for FRANK’S. The Biochemical Oxygen Demand averages at 100 to 120 ppm. These reports are given to FRANK’S for matters of record.

## Conclusion

FRANK’S has conducted two more replicated tests to determine the viability of EM. They also showed consistent decreasing numbers. Now, FRANK’S and EM Technologies, Inc. will target sewage treatment facilities to alleviate overloading. These tests indicate remediation in 3 to 4 days, however, septage content will differ according to demographics. Depending upon the age of the family unit, the content of the septage will differ. There might be more production of sludge and solids than liquids. The living habits of the family units will determine the content of the septic tank. Some septic tanks don’t need frequent servicing than others. After EM treatment, there is consistent drop in all parameters (i.e., BOD,

TSS, and Ammonia-N); however, depending upon the content of the septage, the drop in all parameters might be erratic. All in all, what matters is the result, turning septage into dirty water for discharge.

**Reference**     **Eddy, Natalie.** 1999. Septic tanks in the United States: How many are there, where are they, and are they working properly, **Pumper**, September 1999, Cole Publishing, Inc.

Fig 1. The Biological Oxygen Demand Total Suspended Solids and Ammonia Nitrogen during a Nine Week Period Commencing Few days after Treatment.

