I have founded two start-up-companies, first one is SAR6 Inc., a geotechnical firm for performing geotechnical testing and subsurface investigation to determine engineering properties of soils accurately, and GeoRamesh Deep Densification Inc., a construction firm solely for installing porous displacement piles for deep densification of subsurface soil layers using an innovative method of rapid consolidation and compaction.

SAR6 Inc.

In addition to performing existing soil tests and subsurface investigation methods in accordance with ASTM, SAR6 Inc. shall also perform 21st century geotechnical testing procedures (i) triaxial compression, unconfined compressive strength and uniaxial compressive strength tests using expandable jacket (US Patent No. 10060898), (ii) three-dimensional consolidation tests (US Patent No. 10060898), and (iii) subsurface investigation using load tests on short model piles at various depths of a soil deposit for determining load-settlement relationship and engineering properties of soils and intermediate geomaterials in conjunction of SPT, CPT, CPTu, DMT and PMT (US Patent No. 10823880).

Triaxial compression tests performed using an expandable jacket around a cylindrical specimen have shown that radial expansion of the cylindrical specimen is uniform throughout its height, and barrel shape of the specimen does not form, and new area of cross-section, deviator stress, shear strength and volume change characteristics are accurately determined. Without using the expandable jacket around the cylindrical specimen, instead cylindrical shape, barrel shape of the specimen used to form, resulting in premature failure, lower shear strength and inaccurate volume change characteristics. The recent triaxial compression tests with the expandable jacket around the cylindrical specimen have shown that shear strength, compressive strength, angle of friction and modulus of elasticity are much higher than that determined without using the expandable jacket. The variation of modulus of elasticity and Poisson’s ratio with increase in value of deviator stress can now be determined accurately.

Since the 20th century, one-dimensional consolidation tests have been performed by applying load in selected increments in vertical direction, allowing dissipation of excess pore-water pressures and settlement in vertical direction only. However, it is known that three-dimensional consolidation with dissipation of excess pore-water pressures and settlements both in vertical and horizontal-radial directions occur. Three-dimensional consolidation tests performed on

Ashburn Clay have shown that the three-dimensional consolidation is much faster than that determined by one dimensional consolidation tests, both vertical and horizontal consolidation settlement is much different than that determined from one-dimensional consolidation tests. Therefore, it is now possible to determine consolidation behavior and settlement accurately with confidence. With the invention of three-dimensional consolidation tests, one-dimensional consolidation tests and associated theories may become obsolete.

It has been known that the values of engineering properties determined by either SPT or CPTu or DMT or PMT could differ by one another by up to 50% or more. Moreover, for example, values of engineering properties determined from CPT or SPT when compared by one empirical correlation to other correlation could differ up to 50% or more. In such situations, a Geotechnical Engineer has no options other than to assign engineering properties by his local experience. To win over all these shortcomings, the invention of subsurface investigation using load tests on short model piles at various depths of a soil deposit for determining load-settlement relationship and engineering properties of soils and intermediate geomaterials in conjunction of SPT, CPT, CPTu, DMT and PMT (US Patent No. 10823880) shall be very useful by performing (i) load tests on short model piles at various depths at one or two locations of a project site and at other locations, performing either (b) SPT or CPTu, or PMT or DMT and all other locations of the project site in order to make semi empirical or empirical correlations by comparing load test results with the in-situ test results, and (c) then use those site-specific correlation to determine engineering properties of soils accurately for all other locations of the project site, for which those in-situ tests were performed.

GeoRamesh Deep Densification Inc. (GRDDI)

GRDDI is a start-up firm specializing in installing porous displacement piles (US Patent No. 10844568) to densify layers of soft to stiff clayey soils or loose to dense sandy soils to provide adequate support to (i) footings of bridges, buildings, warehouses, water and oil tanks, levees and other structures, (ii) MSE walls and retaining walls, (iii) roads, highways, airport runways and embankments, (iv) tilting towers or structures, (v) structures undergoing continuous settlement, and (vi) to speed up consolidation and sedimentation of tailings in the tailing reservoirs and also to improve safety of tailing dams and dykes.

The existing methods such as vibro-floatation/vibro-compaction/stone columns, rammed aggregates, jet grouted piles, lime or cement mixed columns all disturb the in-situ soils and drill holes with or without using water jets, before beginning to install the elements of their respective methods. These methods provide reinforcements by creating columns but do not densify the clayey soils. The innovative method of installing porous displacement piles does not require drilling any hole to excavate the in-situ soil out of the ground. Pipe sections filled by pre-compacted sandy soil and attached with a removable end plate is driven through the non-displacement piles consisting of hollow pipe sections to not let any heave occur at the ground surface. When the above-said pipe section has been driven to the design depth up to which soil is to be densified, the pipe section is pulled out of the ground, leaving behind the removable end plate and the column of pre-compacted sandy soil in to the ground up to a design depth up to which soil is to be densified. To prevent any necking in the column of compacted sandy soil to form and to push sandy soils in the space previously by the pipe section, a heavy sliding weight inside the pipe section is placed on top of the compacted soil, before pulling out of the pipe section. Thus, the column of compacted soil left in place into the ground behaves as a porous displacement pile, displacing the in-situ soil sideways into the soil matrix and creating very high excess pore-water pressures equal or greater than what is recorded during the cone penetration.

During dissipation of excess pore-water pressures and flow of pressured pore-water through the installed porous displacement pile, it is very important to prevent migration of fine particles of in-situ soil into the compacted sandy column. For that purpose, the particle size distribution or gradation of compacted sandy soil is designed to meet filter criteria same as that is used for chimney filters of high earth-fill dams, so that the objective of preventing migration of fine particles and allowing free flow of pressured pore-water through the column of compacted sandy soil is accomplished.

With the innovation of porous displacement piles, there shall be no need of using steel or concrete piles etc., or drilled shafts under the footings of structures in most soil conditions, because densified soil shall provide adequate support to the structures. The corrosion of steel piles and decay of concrete piles and drilled shafts occur in certain soil conditions, but there is no such risk when porous displacement piles are used. Since densified in-situ soil is compressed to very high pressures by installing porous displacement piles, settlement under load of the structure will occur in recompression and therefore shall be very small or almost negligible. In clayey soils, during construction of the substructure and superstructure, if any excess pore-water pressures develop, it will rapidly dissipate through the porous displacement piles. By installing porous displacement piles, there is no danger of down-drag to occur, as occurs after driving steel or concrete piles etc., delaying completion of construction because of need of constructing surcharge fill and waiting for consolidation to occur.

Detailed information about these inventions is available on the website, www.sar6inc.com. For any questions, contact at rcg@sar6inc.com or docrcg@gmail.com, or at Phone:1-(804) 405 7956,

Please provide us an opportunity to use these economical, and safe innovative methods on your design-build or other projects to speed-up the construction time and to reduce the cost of the project by us as your sub-contractor. We can also provide value-engineering proposals for your currently running projects. For submitting our proposals and schemes using the above-mentioned 21st century inventions, we shall require brief details of your project drawings and specifications. If there are any questions, please call me or email me.