

### **What is a Data Center and Why Is It Important?**

Data Center is the location where computer and network equipment are gathered in a central location for the purpose of collecting, storing, processing and distributing data. Data Centers enable the execution of all processes and activities surrounding our lives, such as all industries, health institutions, government agencies, banking and financial institutions, e-commerce sites, social media, where services, such as telecommunication, online games, banking, utilities, cloud storage, patient recording, etc. are being provided.

Data Centers are used in a broad range, from small SMEs to conglomerates with hundreds of thousands of employees. It is very important that the service continuity of Data Centers is reliable and complete both in their internal activities and in services they provide to their customers. Otherwise, the internal activities and services they provide to their customers of businesses and government agencies will be interrupted and as a result they would lose money and reputation.

Here is an example how the service continuity of Data Centers would be interrupted;

Consider the challenges that health institutions with Data Centers had to face when their service has been interrupted due to the coronavirus epidemic that we experience today and that suddenly entered our lives: Being not able to share the results of PCR tests with doctors and government agencies, lung tomography data getting lost, erroneous filiation procedures and interrupted patient tracking system, etc.

Be it small and medium sized or large businesses; in the event that a Data Center's service gets interrupted where all product designs and drawings, manufacturing programs and plans, customer data are stored, it will lose money and reputation due to many reasons such as failure to produce product/service, late delivery and interruption of internal service.

Data Centers need servers, IT equipment, air conditioning systems, energy systems (Transformers, UPS, Generators), fire extinguishing and security systems in order to provide services.

### **Data Center Classes**

Large and small Data Centers determine the annual Data Center service interruption duration that they can tolerate in line with their own needs and the service requirements of their customers. Criteria such as the type, quality, redundancy, etc. of the equipment to be used in the Data Center arise depending on the downtime they can tolerate.

The most known Data Center classification in the market is Tier I, II, III and IV. This classification is generally related to how long Data Centers would experience downtime due to unexpected problems. For example, a Data Center according to Tier IV class can be interrupted for a total of 0.8 hours per year.

### **The Importance of Generators in Data Centers**

In case of power outages caused by unexpected problems, Data Centers are required to use generator sets in order not to exceed the annual total downtime periods specified in the Tier classification. Generator sets should activate in case of a city utility(mains grid) power outage caused by any problem, supply the Data Center seamlessly and continuously until the utility(mains grid) power is restored, and ensure the continuity of the Data Center.



Failure of the Data Center to ensure the continuity of service due to power failures means that the service provided by the corporations would be interrupted. Since interruptions due to unexpected problems will be avoided by using a generator set in the Data Center, generator sets should be used which are reliable sources of power.

The generator set should be capable of continuously supplying the electrical power during the outage which the Data Center requires, and it should also operate and supply the Data Center following the power outage. The right generator set and equipment for this should be chosen by expert generator manufacturers and in accordance with the Data Center class, operating environment conditions, requirements of the Data Center, international standards and local regulations. Otherwise, even if the generator set operates and is able to supply the Data Center with the required electricity following a power outage, it cannot supply the Data Center with the required electricity due to malfunctions and problems during a continuing power outage.

### **Holistic Approach**

After a power outage, in critical facilities such Data Centers, the generator set should be able to start-up quickly and supply the load. After a power failure, the UPSs continue to supply the Data Center uninterruptedly, but their capacity is limited. It is very important that the generator set is activated before the capacity of the UPS runs out. Most generator manufacturers mention that generator sets can start quickly and supply the Data Center, but this alone is not enough to ensure the service continuity of the Data Center. The generator set must be capable of starting quickly after the outage, supplying the Data Center and providing electrical energy seamlessly and continuously during a power outage. Providing seamless and continuous electrical energy during an outage can only be achieved by following a holistic approach to Data Center projects.

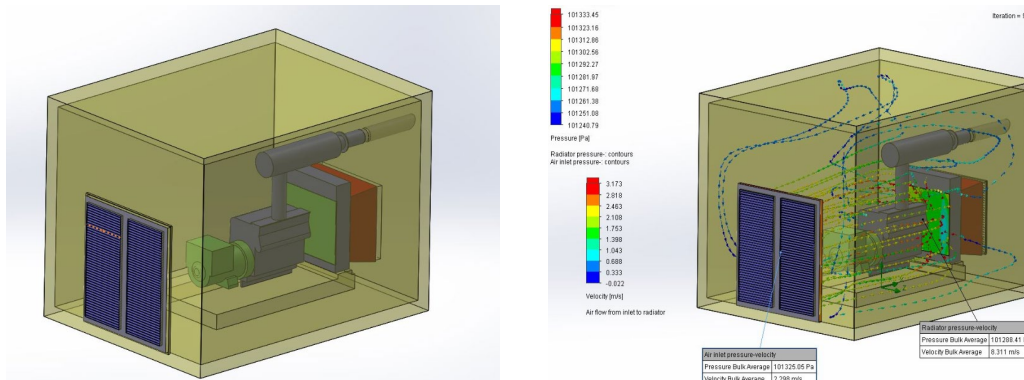
Regardless of the required generator set power class for Data Centers being a DCP (Data Center Power), Prime or Standby, the generator set should be evaluated as a whole with its main and auxiliary equipment. All equipment used in the generator set, including the internal combustion engine, alternator, radiator, chassis, control system, starter system, etc. should be configured as such that the set can start quickly and provide electrical energy seamlessly and continuously. Although it is important that each equipment can provide this independently, the whole generator set consisting of all these equipment used must comply with the ISO 8528 standard series and Data Centers.

Use of a block water heater is standard in our generator sets and it enables that the generator set can be activated quickly after a power outage in the Data Center. In line with the class of the Data Center and customer request, we also use optional equipment such as a backup starter system, a backup electric starter and a backup battery system, but these alone are not sufficient.

The generator set, together with all its equipment, should be suitable for the ambient conditions of the site where the Data Center is located and it should be evaluated that it can operate smoothly in those ambient conditions (such as temperature, humidity, altitude, dust and air quality). If the generator set and its equipment are used either in a room or with a cabin, the ventilation and cooling system should be designed taking into account that the heat emitted from the generator set will increase the room and cabin temperature. In order to design a suitable ventilation and cooling system, first the generator set's layout in



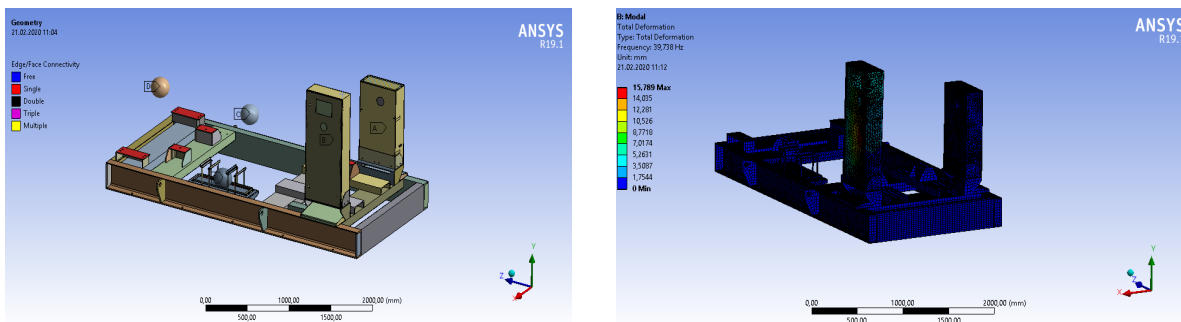
the room should be viewed in 3-D and the performance of the generator set should be evaluated with all its equipment by performing flow analysis/simulation via simulation programs.



Layout and Ventilation Flow Analysis in 3D

In the ventilation flow analysis several necessary calculations are to be made: ventilation back pressure, temperature increase in the room and the effect of this temperature increase on generator set equipment, exhaust system back pressure, etc.

Mechanical evaluations including generator set vibration, chassis performance in long-term operation, etc. should be conducted in order for the generator set equipment to generate electrical energy as long as the power outage continues in the Data Center. Thanks to our ANSYS and SolidWorks programs in our R&D center, we can analyse the mechanical performance of our generator sets and if the results are positive, we can manufacture the generator set and test/verify it with our test equipment and see how the generator set we designed and simulated actually performs. With these engineering methods, we provide generator sets suitable for continuous operation to data centers which are regarded as critical facilities.



The ANSYS Model and Verification

Along with all the issues mentioned above for Data Centers; from generator set power to ambient conditions, from the block water heater to the antifreeze used, from the lubricant to the fuel and fuel system to be used in the internal combustion engine, from engine air filter, alternator and alternator performance, how the generator set will perform for IT loads from data centers, to the battery and starter system, from circuit breaker to generator set control device and to all electrical and mechanical protections, application type and operation type, generator set performance class, frequency and voltage regulation, all factors affecting generator set output power, from exhaust back pressure control to ventilation flow analysis, from vibration



to generator set vibration isolators and to calculations of chassis fatigue, we provide solutions and services by using several engineering disciplines.

Only the Data Center-compatibility of a generator set specially designed and manufactured for the Data Center is still not enough. Installation, commissioning and site tests should be performed by generator set manufacturers who are experts in their fields, and the generator sets and equipment they designed/simulated should deliver the same performance after installation.

Comprehensive and detailed maintenance agreements should be made for the generator set provided for the Data Center after its installation. Maintenance and service should be performed by generator manufacturers who are experts in their fields. Scheduled maintenance of generator sets is very important. Applying a good maintenance program is the most important factor for a long operating and economic life of the generator set. Thanks to planned maintenance, the generator set will be ready for service at any time and failure risks will be minimized. For this reason, by making a "Periodic Maintenance Agreement" with generator manufacturers who have Quality Certificates such as ISO 9001, ISO 14001, OHSAS 18001, TSE Service Qualification Certificate and After Sales Service Qualification Certificate, the inspections and maintenance are completed at regular intervals and are economical and the generator can operate without any problems.

It is very important to choose a generator manufacturer that can keep spare parts stocks ready at all times. Generator set manufacturers with a large stock of spare parts should be selected for both spare parts required for maintenance and rapid replacement of defective parts.

As a result, the continuity of service of the Data Center cannot be achieved without a holistic approach where all processes such as product design, manufacture, testing, assembly and commissioning, field tests, maintenance and keeping spare parts ready can be carried out. As Teksan Generator, we realize this holistic approach not only for Data Centers but also for all your projects and applications. Our holistic approach prevents today the loss of money and reputation of Data Center owners and will prevent it in the future. With our holistic approach, we take into account the sensitivities of Data Center industry in particular and take it to the next level.

