

Let's make full use of e-DPP / ETAP-DPP.

“Key Points for Load Summary” (Topic #17) Part 6: Lumped Load Applications (Follow-up 2)

This issue discusses “Base Load” as a last topic for the suite topics, “Key Points for Load Summary” in e-DPP Load Summary features. “Base Load” denotes the operating load in a steady state during the Network Study as you know. Following are the points to keep in mind when calculating the Base Load using e-DPP Lumped Load Summary feature.

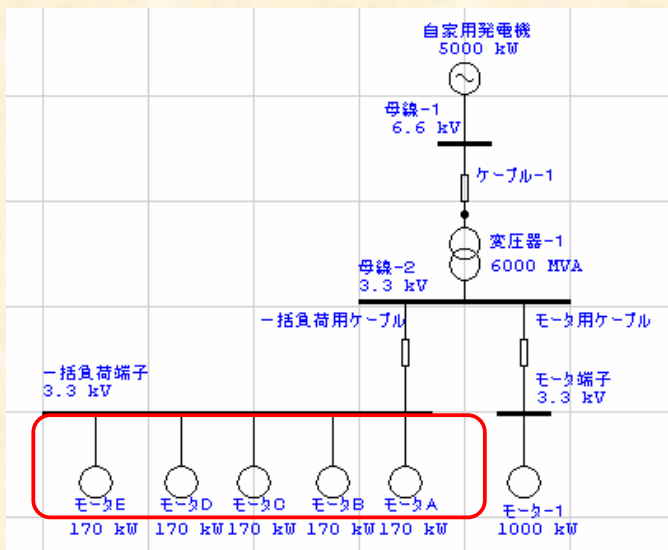
When performing various calculations in ETAP, the model for each element of generator and motor, etc. is different for the kind of calculations.

Handling of Steady State Load Model for various ETAP calculations

	Short Circuit	Static Motor Start	Dynamic Motor Start	Transient Stability
Lumped Load (Motor Portion)	Contribution	kVA Constant	kVA Constant	kVA Constant
Induction Motor Synchronous Motor	Contribution	kVA Constant	kVA Constant	Dynamic Model or kVA Constant Load
Generator	Short Circuit Source	Xd' Constant Behind Voltage	Xd' Constant Behind Voltage	Dynamic Model
Exciter Governor	—	Not modeled	Not modeled	Dynamic Model

(Note: Induction/Synchronous Motors are not Starting/Accelerating Motors.)

Especially you need to pay attention to handling of Lumped Load when you execute the special motor starting calculation. Motor portion designated in the Lumped Load is treated as “kVA Constant Load” in Motor Starting Study. It is not advisable to treat the motors which need dynamic modeling as Lumped Load. Let us see more specifically.



<ETAP One Line Diagram / Individual Motors>

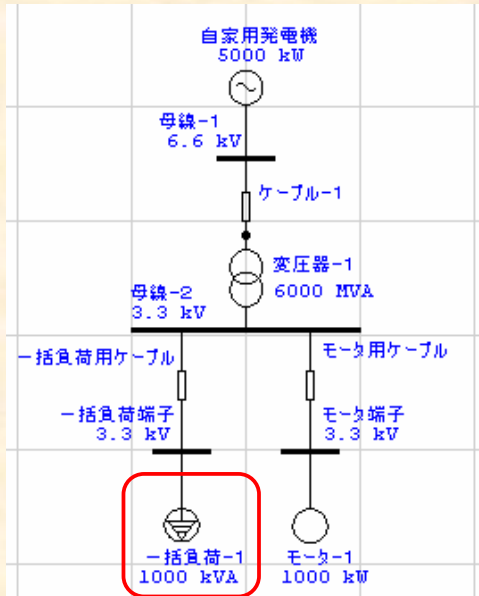
Figure left is the network which models individually all the motor A to E.

Start Motor-1 (3.3kV, 1000kW) during 5 Motors A to E are operating in a steady state.

Major characteristics for Motors A to E are as follows.

- Rated Voltage 3.3kV
- Rated power 170kW
- Rated PF 0.85
- Rated Efficiency 100% (for comparison)
- Load factor 100%

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<ETAP One Line Diagram / Lumped Load>

On the other hand, Figure left summarizes 5 motors A to E as Lumped Load-1.

In order not to disturb the coincidence data, characteristics of the Lumped Load are set as follows.

- Rated voltage 3.3kV
- Rated Capacity 1000kVA (850kW)
- Rated PF 0.85
- Load Factor 100%
- Motor Portion 100%
- Static Load Portion 0%

Motor Starting (MS) and Transient Stability (TS) Studies for Motor-1 are executed for the above 2 network models and results are compared. Voltage Drop during the Motor Starting will increase the current for kVA Constant Load in inverse ratio to the reduced voltage during steady state operations.

<Lumped Load>

	Dynamic Motor Starting (MS)		Transient Stability Study (TS)	
	Before Start	After Start	Before Start	After Start
Lumped Load Operating Current	177(A)	215(A)	176.6(A)	215(A)
Lumped Load Terminal Voltage	99(%)	81.5%	99(%)	81.6%
Motor-1 Starting Time	7.2(s)		3.8(s)	

<Individual Motors>

	Dynamic Motor Starting (MS)		Transient Stability Study (TS)	
	Before Start	After Start	Before Start	After Start
Motor Total Current	177(A)	215(A)	170.0(A)	207(A)
Motor Terminal Voltage	99(%)	81.5%	99(%)	81.9%
Motor-1 Starting Time	7.2(s)		3.8(s)	

(Note) Exciter and Governor for Generators modeled for Transient Stability Study and all the steady state operating motors are also dynamically modeled. MS and TS use the same equivalent circuit models for Motor Characteristics Models and Load Models use the Pump Models.

Calculation results are not much different comparing Lumped Load case and Individual Load for Motor Starting (MS) Study. On the other hand you can see the difference of calculation results in Motor Acceleration Study in TS, comparing with steady state operating motors and Lumped Load, as the motor parameters which do not exist for Lumped Load is applied.

(End)

From the next issue on, "Template Design" will be discusses do that users may create EXCEL output forms as users wish.

If you have problems or requests and need solutions, please feel free to contact;

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