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USING OF CAPABILITIES MS EXCEL IN DETERMINING THE VOYAGE FUEL STOCK

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In the contex of informatization of all spheres of human activity, a modern professional should be in possession of "computer literacy". The basic computer knowledge is necessary for each specialist to work with different information volumes, making of exchange data and other important operations. The basic knowledge of MS Word and Excel is a requirement for almost all professionals. The maritime sphere is no exception and future captains, ship engineers, ship electricians should be able to use information technology to solve their professional tasks.

The purpose of this article is to show the practical application of the knowledge that has been acquired on the classes by discipline "Information technology" in the work of the ship's mechanic by a specific example. The main accent is made on the skill to use the functions and capabilities of Excel in solving the task at hand.

A ship mechanic should not only ensure trouble-free and reliable operation of all types of equipment, their correct operation, timely quality repair and maintenance, but also be able to rationally use information technologies to solve competency problems related to the operation of ship’s power plants, work with large databases, perform various calculations (competences of CI-7, CI-8).

The cadets of Marine Engineering Faculty of KSMA study the discipline "Information Technology" two semesters. A special place in the course is occupied by the section "Computing capabilities of MS Excel". In the first semester they get acquainted with the basic functions and work methods of the Excel spreadsheet processor, and in the second semester - directly apply the acquired knowledge in solving professional tasks.

As an example, let's consider one of the tasks that ship mechanics has to solve when planning a voyage.

. Determine fuel stock for the period of autonomous navigation of the vessel using capabilities of MS Excel.

The fuel stocks are the important among of the voyage reserves. The fuel consumption on a ship depends on many factors, the main ones are:

- type, power and technical condition of the ship’s power plant;
- type and grade of fuel;

- duration of the voyage;
- speed of the ship;
- ship's sailing area;
- Climatic conditions and seasons, etc.

Also, it is necessary to take into account the so-called storm fuel stock, which is about 20% of the total reserve.

The task is to calculate the weight of the fuel required for the sailing, taking into account the factors and conditions described above. To solve this problem, a *Fuel Stock* form was created in the Excel spreadsheet processor, shown in Fig. 1.

	A	B	C	D	E	F	G	H	I
1	Type of vessel: tanker								
2	Season	Navigation zone of the vessel			Course		Navigation duration, hour	Ship's speed	Storm fuel stock
3		Oceans	Seas		Degree	Direction			
4	Winter-Spring	Pacific	Sea of Japan	to North	40,0°	N	140	15	35%
5									
6	Steaming time	120	h		Fuel stock for voyage		177,8	t	
7	Mooring time	15	h		Storm fuel stock		62,2	t	
8	Boiler runtime	10	h		Total		240,0	t	
9									
10	Fuel type								
11	MDO								
12									
13	Fuel consumption per boiler	68	kg/h						
14									
15	Main ship engine								
16	Producer	MIRLIS							
17	Engine	KV (ЧРН38,1/43,7)							
18	Power of engine	4942,56		kW					
19	Specific fuel consumption	0,204		kg/(kW*h)					

Fuel stock | Lists | Diesel engine

Figure 1. Sheet of form Fuel stock

In the our work the choice of all parameters is made at the expense of created drop-down lists with data sources on the sheets Lists and Diesel engine. The combination of *INDEX()* and *MATCH()* functions is used to determine parameters such as engine power and engine specific fuel consumption.

	A	B	C	D	E	F	G	H	I	J	K	L
1			Navigation zone of the vessel								Fuel type	
2			Oceans	Seas					Direction		Full name	Short name
3	Season			1	2	3	4	5	to North	N	Heavy Fuel Oil	HFO
4	Summer-Autumn	1	Atlantic	Hudson Bay	Barents Sea	Red Sea	Bering Sea	Amundsen Sea	to South	S	Low Sulfur Fuel Oil	LSFO
5	Winter-Spring	2	Arctic	Baffin Bay	Kara Sea	Gulf of Aden	Gulf of Alaska	Weddell Sea	to East	E	Marine Diesel Oil	MDO
6		3	Indian	Gulf of St. Lawrence	Beaufort Sea	Persian Gulf	Sea of Cortez (Gulf of California)	Ross Sea	to West	W	Marine Gas Oil	MGO
7		4	Pacific	Caribbean Sea	Greenland Sea	Gulf of Oman	Sea of Okhotsk	Great Australian Bight				
8		5	Southern	Gulf of Mexico	Chukchi Sea	Arabian Sea	Sea of Japan	Gulf St. Vincent				
9				Sargasso Sea	Laptev Sea	Bay of Bengal	Seto Inland Sea	Spencer Gulf				
10				North Sea	East Siberian Sea	Gulf of Thailand	East China Sea	None				
11				Baltic Sea	None	Java Sea	South China Sea					

Fuel stock | Lists | Diesel engine

Figure 2. Data sheet for parameter selection

The calculation formulas were created for achieve goal:

1. To determine the storm stock (k) taking into account the navigation zone and season (built-in logical Excel functions). We will take as the conditions the following: for all areas of navigation in summer time the storm stock is 5%, except: Atlantic Ocean to the north of 50°N - 10%; Bengal Bay - 15%; Arabian Sea - 30%. In winter: Baltic Sea and Sea of Japan - 20%; Black Sea -10%; Mediterranean Sea north of 40°N - 20%, the rest of the sea -5%; Atlantic Ocean south of 30°N - 5%, 30 to 40°N - 30%, 40 to 50°N - 35%, north of 50°N - 40%; Pacific Ocean south of 15°N - 5%, 15 to 30°N - 10%, north of 30°N - 35%; Indian Ocean -5%. We will take the storm stock of 20% for the rest navigation zone [1].

2. For calculating the weight of the voyage fuel stock (according to formulas from the course "Ship's Power Plants"). Fuel stock is determined by the formula [2]:

$$B_f((g_e \cdot N_e + g'_e \cdot N'_e) \cdot t_s + g''_e \cdot N''_e \cdot t_m + B_b \cdot t_b) \cdot 10^{-3},$$

where g_e, g'_e и g'' – Specific fuel consumption for main and auxiliary engines, kg/(kW·h);

N_e, N'_e, N''_e – Power of main and auxiliary engines, kW;

t_s and t_m – Ship's steaming and mooring times, h;

B_b – Fuel consumption per boiler, kg/h.

We will find the voyage fuel stock taking into account the storm stock by the formula: $B = B_f + k$.

The resulting formulas are shown on the next screenshot.

	D	E	F	G	H
6			Fuel stock for voyage	=((B19*B18+B25*B24)*B6+B31*B30*B7+B13*B8)/1000	t
7			Storm fuel stock	=I4*G6	t
8			**Total**	**=G7+G6**	t

Figure 3. Formulas for determining fuel stock in an Excel spreadsheet

Based on the results of the calculations performed for the task in the Excel spreadsheet processor, the conclusion about important of using computer technologies in the work of ship mechanics can be concluded. The knowledge and skills acquired on the classes by the discipline "Information Technology" help to make the solution of his professional tasks more effective and automated.

References

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ПРОТОКОЛ КОНСЕНСУСУ PROOF OF ACTIVITY В ДЕЦЕНТРАЛІЗОВАНИХ СИСТЕМАХ

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Актуальність проблеми. Децентралізовані системи набувають поширення у різних застосуваннях, зокрема, при побудові незалежних та непідзвітних фінансових інструментів (криптовалют), розгортанні різних за масштабом та призначенням електронних інформаційних систем (голосування, ідентифікації, тощо), побудові нових прикладних технологій на заміну традиційних централізованих інститутів (нотаріату, кадастрів, реєстрів, тощо) [1-3]. Отже питання вивчення основних компонентів та технологій побудови сучасних децентралізованих систем є надзвичайно важливими та актуальними.

Мета. В цій роботі досліджується один із протоколів встановлення консенсусу, який значно зменшує накладні витрати на функціонування мережі блокчейн за рахунок застосування іншого алгоритму (доказу активності, або Proof of Activity).

Основна частина. Система блокчейн представляє з себе неперервний ланцюг блоків, який містить інформацію і одночасно зберігається на багатьох комп’ютерах. Вона використовується у різних сферах діяльності, таких як: система мікроплатежів; система банківських операцій; логістиці; юриспруденції; медицині, тощо. Всього за кілька років блокчейн вже пройшов шлях від новинки в технологічному світі до інструменту, яким починають користуватися великі банки, корпорації та держави. Це зміцнює впевненість в тому, що в майбутньому технологія розкриє свій потенціал ще сильніше.